

SELECTED



WATER

RESOURCES

ABSTRACTS



VOLUME 7, NUMBER 2
JANUARY 15, 1974

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

**A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior**



**VOLUME 7, NUMBER 2
JANUARY 15, 1974**

W74-00551 -- W74-01100

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

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07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

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09 MANPOWER, GRANTS, AND FACILITIES

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

ISOTOPE EFFECT AND THE MOLECULAR MECHANISM OF THE SECOND VISCOSITY COEFFICIENT OF WATER,
Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
E. McLaughlin.
Journal of Physical Chemistry, Vol 77, No 14, p 1801-1802, July 5, 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Water properties, *Viscosity, *Mathematical studies, *Mass transfer, *Isotope studies, *Heavy water, *Fluid mechanics, *Rheology, Viscous flow, Sound waves, Thermal conductivity, Theoretical analysis, Statistical methods, Shear.

In formulating statistical theories of transport process in liquids, information is needed on the molecular mechanism of transport. Such information can be obtained by studying the transport behavior of isotopic molecules in which masses and inertial moments can be altered without significantly affecting the parameters of the intermolecular potential. This method, which was used earlier to investigate shear viscosity and thermal conductivity, is applied to the examination of molecular mechanisms in the viscous processes determining the second viscosity coefficients of water. Appropriate sound-absorption data in ordinary and heavy water (deuterium oxide) are analyzed to derive the second viscosity coefficient. (Brown-IPC)
W74-00770

02. WATER CYCLE

2A. General

A METHODOLOGY FOR ASSESSMENT OF WATER RESOURCES DEVELOPMENT: A COMPETITIVE EVALUATION MODEL FOR WATER RESOURCES DEVELOPMENT PLANNING,
Oklahoma Univ., Norman. Bureau of Water Resources Research.
For primary bibliographic entry see Field 06B.
W74-00559

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 11 FRESHWATER UNIONACEAN CLAMS (MOLLUSCA:PELECYPODA) OF NORTH AMERICA,
Michigan Univ., Ann Arbor. Dept. of Zoology.
J. B. Burch.
Copy available from GPO Sup Doc as EP1.16:18050 ELD 03/73, \$4.10; microfiche from NTIS as PB-224 831, \$1.45. Environmental Protection Agency, Water Pollution Control Research Series, March 1973. 176 p, 154 fig, 71 ref. EPA Project 18050 ELD 03/73.

Descriptors: *Aquatic fauna, *Mollusks, *Pelecypods, *Mussels, Distribution, *North America, Data collections, *Biota.
Identifiers: *Identification manual, Illustrated key, *Unionaceans, Species list.

Bivalved mollusks of the superfamily Unionacea (Order Schizodontia) are represented in North America by three families, 46 genera, and, as treated in this key, 221 species. The primitive Margaritiferidae are represented by two genera and four species, the Ambloideidae by eight genera and 25 species, and the very large family Unionidae by 36 genera and 192 species. Systematics are not well worked out in many groups, which makes a definitive listing of species somewhat arbitrary at

this time. The present key in most instances reflects a conservative approach to the lower taxa and, although it omits many nominal species of doubtful validity, the key nevertheless represents most of the biological species. Characters of soft anatomy are used to separate the families, subfamilies and, in a few cases, genera. Species are separated by shell characters. The main feature of this publication is an illustrated taxonomic key using both soft anatomy and shell characters for the identification of the North American Unionacea. (See also W73-13736 thru W73-13744, and W74-00563) (EPA)
W74-00564

SURFACE-GROUNDWATER RELATIONSHIPS ON THE EASTERN DNIESTER LEFT BANK (O VZAIMOSVYAZI PODVERKHOSTNOSTYKH I PODZEMNYKH VOD NA VOSTOKE LEVOBE-REZHNOGO PODNESTROV'YA),
Ukrainski Nauchno-Issledovatel'ski Gidrometeorologicheskii Institut, Kiev (USSR).
N. I. Drozd, and K. A. Lysenko.
In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainski Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 100, p 131-138, Moscow, 1971. 2 fig, 3 tab, 1 ref.

Descriptors: *Surface-groundwater relationships, *Rainfall-runoff relationships, *Streams, Recharge, Aquifers, Inflow, Hydrologic budget, Gaging stations, On-site investigations.
Identifiers: *Dniester River (USSR).

Computations of groundwater inflow to streams in the eastern Podolia Region from Ushitsa in the west to Kamenka and Beloche in the east were based on hydrologic observations by a network of gaging stations in 1946-65 and on on-site investigations by the Ukrainian Hydrometeorological Scientific Research Institute in 1967-68 and 1970. A gradual and steady increase in average monthly groundwater contribution to flow in the Batyg River at Zamekhov village ranging from 6 to 10 mm in 1949 and from 8 to 11 mm in 1950 indicates a considerable lag in groundwater response to precipitation, i.e., a presence of large storage capacities in the principal aquifers discharging into the stream. Annual runoff and precipitation in 1947-65 and monthly runoff depths and precipitation in 1949-50 are tabulated for the river and bimonthly variations in precipitation and runoff of the river in 1949-50 are graphed. (See also W74-00592) (Josefson-USGS)
W74-00601

PREDICTION OF AIR TEMPERATURE AT A REMOTE SITE FROM OFFICIAL WEATHER STATION RECORDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. E. Campbell.
USDA Forest Serv. Res. Note RM-223, 1972. 4 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Air temperature, Semiarid climates, Remote sensing, Meteorological data, Synoptic analysis, Weather patterns, Weather data, *Weather forecasting, Watershed management, *New Mexico.
Identifiers: *Temperature forecasting.

Air temperatures at the San Luis experimental watershed were predicted from temperatures at Albuquerque, New Mexico, on the basis of linear regressions between temperatures at the two locations calculated from a full year of continuous record at San Luis and official 3-hour records at Albuquerque. Hourly temperatures were predicted within plus or minus 6.3 to 7.8F., depending on time of day. Predictions of daily mean temperatures at San Luis were within plus or minus 3.8F.

Monthly mean temperatures for a given time of day were predicted within plus or minus 3.6 to 5.5F. (Forest Service)
W74-00692

VARIABILITY OF ANNUAL RUNOFF AND PRECIPITATION VALUES (OB IZ-MENCHIVOSTI GODOVYKH VELICHIN STOKA I OSADKOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 04A.
W74-00844

CONSIDERATION OF THE CHARACTER OF SURFACE-GROUNDWATER RELATIONSHIPS AND STREAMFLOW IN ESTIMATES OF YIELDS FROM INFILTRATION GALLERIES (UCHET KARAKTERA SVYAZI PODZEMNYKH VOD S PODVERKHOSTNOSTYMI I REZHIMA RECHNOGO STOKA PRI RASCHETAHK INF IL'TRATSIONNYKH VODOZABOROV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 08A.
W74-00848

SYSTEMS ENGINEERING APPROACH,
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 06A.
W74-00940

DEVELOPMENT OF A SNOWMELT-RUNOFF MODEL FOR THE U.S. TUNDRA BIOME, PROGRESS REPORT,
For primary bibliographic entry see Field 02C.
W74-01094

2B. Precipitation

SNOW FENCES FOR INFLUENCING SNOW ACCUMULATION,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W74-00684

WEATHER CONDITIONS THAT DETERMINE SNOW TRANSPORT DISTANCES AT A SITE IN WYOMING,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W74-00685

PREDICTION OF AIR TEMPERATURE AT A REMOTE SITE FROM OFFICIAL WEATHER STATION RECORDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02A.
W74-00692

A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),
Texas A and M Univ., College Station. Dept. of Meteorology.
J. R. Scoggins, H. E. Fuellberg, R. D. Carlson, R. W. Phelps, and D. G. Bellue.
Available from NTIS, Springfield, Va 22151 as NASA CR-2304 Price \$3.00 printed copy, \$1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2304, August 1973. 192 p. NASA Contract NAS 8-26751.

Field 02—WATER CYCLE

Group 2B—Precipitation

Descriptors: *Meteorology, *Weather forecasting, *Southeast U.S., *Atmospheric physics, Data collections, Methodology, Air temperature, Rainfall, Winds, Wind velocity, Air circulation, Kinetics, Movement, Air masses, Weather patterns, Climatic data, Orography, Synoptic analysis, Correlation analysis, Satellites (Artificial).

Identifiers: *Atmospheric variability, Spacecraft, Aerospace technology, Rawinsonde data.

The importance of meteorological systems too small to be detected and analyzed from upper-air synoptic data taken at 12-hr intervals in local weather forecasts and variability of parameters such as wind, temperature, and stability, has long been recognized. Because of the importance of subsynoptic-scale phenomena in the design and operation of space vehicles and the need for a better understanding of these phenomena, the Aerospace Environment Division of NASA's Marshall Space Flight Center carried out a measurement program during the period February 19-22, 1964. Rawinsonde soundings were made at 30 stations over the eastern part of the United States south of the Great Lakes. Soundings were made at intervals of 3 hours at all stations except Huntsville, Alabama and Mississippi Test Facility (near New Orleans), where soundings were made at intervals of 1.5 hours. This is known as the Atmospheric Variability Experiment I (AVE I). Four studies conducted at Texas A and M University under NASA Contract, using the AVE I data, are described. (See also W74-00852 thru W74-00855) (Woodard-USGS)

W74-00851

A STUDY OF WINTER PRECIPITATION AREAS IN RELATION TO SEVERAL INDICATORS OF VERTICAL MOTION—CHAPTER I OF A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),

Texas A and M Univ., College Station. Dept. of Meteorology.

H. E. Fuellberg.

In: National Aeronautics and Space Administration Contractor Report NASA CR-2304, p 3-58, August 1973. 25 fig, 27 tab, 25 ref. NASA Contract NAS-26751.

Descriptors: * Meteorology, *Rainfall, *Southeast U.S., *Weather forecasting, *Atmospheric physics, Air circulation, Meteorological data, Data collection, Methodology, Air masses, Advection, Weather patterns, Air temperature, Climatic data, Orography, Kinetics, Winds, Wind velocity, Synoptic analysis, Cloud physics, Satellites (Artificial), Correlation analysis.

Identifiers: *Atmospheric variability, Vertical motion, Orographic lifting, Omega equation, Vorticity equation, Aerospace technology.

Five methods for obtaining the sign of vertical motion at various levels in the atmosphere were investigated to determine which gave the best explanation for areas of rain and no rain in the southeastern United States during the period February 19-22, 1964. The methods used were the terrain-induced vertical motion, the kinematic method including the terrain effect, the adiabatic methods, the omega equation, and the vorticity equation combined with Dines' Compensation Principle. Orographic lifting was an important factor in producing the observed precipitation; 63% of the occurrence of rain and no rain at 130 data collection points was explained by terrain-induced vertical motion alone. Values of vertical motion obtained by the kinematic methods, including orographic lifting at 850 mb, produced the best agreement with observed areas; 80.8% of the data collection points were explained correctly. Various forms of the adiabatic method gave results for the 700-500-mb layer that explained about 72% of the points. The vorticity equation produced results at all levels that verified only about 50% of the time. When terms in the omega equation were added through use of constant multipliers, results com-

parable to the adiabatic method were obtained. Without this addition large uncertainties occurred. Maps showing areas where terms of the omega equation would indicate positive vertical motion did not correlate well with the observed rainfall patterns. (See also W74-00851) (Woodard-USGS) W74-00852

TIME CHANGES IN GRADIENT AND OBSERVED WINDS—CHAPTER II OF A COMPILATION OF STUDIES FROM ATMOSPHERIC IC VARIABILITY EXPERIMENT (AVE),

Texas A and M Univ., College Station. Dept. of Meteorology.
R. D. Carlson.

In: National Aeronautics and Space Administration Contractor Report NASA CR-2304, p 59-121, August 1973. 26 fig, 4 tab, 29 ref, 3 append. NASA Contract NAS-26751.

Descriptors: *Meteorology, *Weather forecasting, *Southeast U.S., *Atmospheric physics, *Wind velocity, Data collections, Methodology, Weather patterns, Climatic data, Meteorological data, Orography, Air circulation, Kinetics, Synoptic analysis, Satellites (Artificial).

Identifiers: *Atmospheric variability, Gradient wind speed, Aerospace technology.

With the advent of air travel, the space age, and numerical weather prediction, wind and its variability at all levels in the atmosphere have become important. Local time changes of the observed and gradient wind speeds were examined at 500 mb for 3-, 6-, and 12-hour time intervals. The correlation coefficients between the changes in the two wind speeds over 3 and 6 hours are statistically not significantly different from zero at the 5% level. For the two 12-hour time intervals studied, the correlation coefficients between the local time changes in the two wind speeds were 0.38 and 0.51 which were statistically significant at the 5% level. A qualitative examination of the 3-, 6-, and 12-hour change of the components of the observed and gradient wind speeds also showed poor results over 3 and 6 hours with improvements over 12 hours. Although the gradient wind speed is generally an acceptable approximation to the actual wind speed, the results of this investigation show that the changes in the gradient wind speed are a poor approximation to changes in the actual wind speed over 3- and 6-hour time intervals, with some improvement over 12-hour intervals. (See also W74-00851) (Woodard-USGS) W74-00853

AN ANALYSIS OF INTERNAL ZONES OF DISCONTINUITY—CHAPTER III OF A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),

Texas A and M Univ., College Station. Dept. of Meteorology.
D. G. Bellue.

In: National Aeronautics and Space Administration Contractor Report NASA CR-2304, p 123-161, August 1973. 24 fig, 16 ref, append. NASA Contract NAS-26751.

Descriptors: *Meteorology, *Weather forecasting, *Southeast U.S., *Cyclones, Air temperature, Rainfall, Data collections, Methodology, Air masses, Weather patterns, Fronts (Atmospheric), Air circulation, Atmospheric physics, Kinetics, Satellites (Artificial), Correlation analysis, Synoptic analysis, Precipitation (Atmospheric).

Identifiers: *Atmospheric variability, Internal zones of discontinuity, Rawinsonde data, Aerospace technology.

Internal zones of discontinuity were investigated which resulted when an open wave in the Gulf of Mexico developed into an east coast cyclone on February 19, 1964. Cross sections of equivalent potential temperature were employed in the location of these zones, which were delineated on the

basis of strong equivalent potential temperature gradients. Processes which caused variations in these zones with time were investigated by use of the frontogenetic function. The x- and z-component equations of this function were evaluated term-by-term and compared with the observed conditions in the cross sections of equivalent potential temperature. The results indicated that regions of intense frontogenesis were associated with strong gradients of equivalent potential temperature within the zones of discontinuity, and regions of intense frontolysis were associated with weak gradients. Also, changes in the slope of the discontinuities were associated with frontolytic/frontogenetic regions. The relationship between these changes in slope and changes in the precipitation patterns was examined, and a close association was found. Finally, the usefulness of the frontogenetic function in the study of the zones of discontinuity was pointed out, and the need was emphasized for more frequent and more accurate rawinsonde data. (See also W74-00851) (Woodard-USGS) W74-00854

AN APPROACH TO THE DETERMINATION OF THE VARIABILITY OF WIND THROUGH THE USE OF QUASI-CONSERVATIVE THICKNESS FIELDS—CHAPTER IV OF A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),

Texas A and M Univ., College Station. Dept. of Meteorology.

J. R. Scoggins, and R. W. Phelps.

In: National Aeronautics and Space Administration Contractor Report NASA CR-2304, p 163-192, August 1973. 9 fig, 3 ref, 2 append. NASA Contract NAS-26751.

Descriptors: *Meteorology, *Weather forecasting, *Southeast U.S., *Atmospheric physics, *Winds, Data collections, Wind velocity, Wind pressure, Air temperature, Boundary layers, Correlation analysis, Air masses, Air circulation, Kinetics, Satellites (Artificial).

Identifiers: *Atmospheric variability, *Quasi-conservative thickness fields, Aerospace technology.

Atmospheric Variability Experiment (AVE) data are analyzed for February 19-20, 1964, to relate changes in measured wind on selected constant-pressure surfaces to changes in the thermal wind for a layer below the constant-pressure surface. Layers of various thicknesses are considered with the base of 950 mb, and others with bases at higher levels. The tops of the layers ranged from 700 to 300 mb. With the assumption of constant wind direction with height, areas with changes in the measured wind at the top of a layer and changes in the thermal wind within the layer less than or equal to 5 m/sec coincided closely for thick layers and time intervals exceeding about 6 hrs. The linear correlation coefficient between changes in the measured and thermal winds less than or equal to 5 m/sec (positive or negative) was positive and significantly different from zero at the 5% level. Changes over periods of 3, 6, 9, and 12 hrs were considered in the analysis. (See also W74-00851) (Woodard-USGS) W74-00855

CURRENT STATUS OF RESEARCH ON THE BIOLOGICAL EFFECTS OF PESTICIDES IN CHESAPEAKE BAY,

Westinghouse Ocean Research Lab., Annapolis, Md.

For primary bibliographic entry see Field 02L.

W74-00923

THE INFLUENCE OF METEOROLOGICAL ELEMENTS ON THE ANNUAL RHYTHM OF HEIGHT GROWTH IN PINES, (IN GERMAN),

Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Eberswalde (East Germany). Institut fuer Forstwissenschaften.

WATER CYCLE—Field 02

Snow, Ice, and Frost—Group 2C

For primary bibliographic entry see Field 02I.
W74-01077

2C. Snow, Ice, and Frost

ICINGS DEVELOPED FROM SURFACE WATER AND GROUND WATER,
Regions Research and Engineering Lab. Hanover,
N.H. Cold Regions Research and Engineering
Lab.

K. L. Carey.
Cold Regions Science and Engineering Monograph
III-D3, May 1973. 65 p, 37 fig, 80 ref. Contract DA
4A062112A894.

Descriptors: *Ice, Highway icing, Ice cover, Cold
regions, Surface-groundwater relationships,
Freezing, Thawing, Permafrost.
Identifiers: *Icings, *Naleds.

Existing knowledge of the occurrence, control, and prevention of icings is summarized. A brief history of icing studies, general descriptions of icings, engineering significance of icings, origins of icings and factors affecting icing formation, techniques for studying icings, techniques for counteracting icings, avoiding icing problems in new construction, and a selected bibliography are included. Icings which are developed from surface water and groundwater can occur either naturally or as a result of man's activities in the cold regions. Thus the icing phenomenon occupies the unusual position of being either a product of the physical environment, or an inadvertently introduced and potentially disruptive influence in the environment. (Knapp-USGS)
W74-00581

PROBLEM OF SIMPLIFYING SNOWMELT COMPUTATIONS (K VOPROSU OB UPROSCHENNOM RASCHETE SNEGOTAYANIYA),

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
V. A. Romanenko.

In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 42-47, Moscow, 1971. 2 fig, 2 tab, 8 ref.

Descriptors: Analytical techniques, *Snowmelt,
*Melting, *Runoff, Water storage, Air temperature,
Methodology.
Identifiers: USSR.

Despite snowmelt computation methods based on solution of the heat-balance equation of melting snow, the application of temperature coefficients of snowmelt for simplified mass computations is valid and expedient. A method is presented for determining snowmelt coefficients from integral curves of the relation between loss in snow storage in areas of simultaneous snowmelt and air temperatures. The method can be used to determine the temperature coefficient of snowmelt as the tangent of the angle of inclination of the line to the snow-storage temperature axis. (See also W74-00592) (Jesefson-USGS)
W74-00596

EFFECT OF FOREST COVER REMOVAL ON DEPTH OF SOIL FREEZING AND OVERLAND FLOW,
Forest Service (USDA), La Crosse, Wisc.
Watershed Lab.
For primary bibliographic entry see Field 02G.
W74-00610

SAMPLING REQUIREMENTS FOR AREAL WATER EQUIVALENT ESTIMATES IN FORESTED SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 03B.
W74-00675

AVALANCHES IN OUR WESTERN MOUNTAINS: WHAT ARE WE DOING ABOUT THEM,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
K. Williams.
Weatherwise, Vol 25, No 5, p 220-227, 1972.

Descriptors: *Avalanches, Disasters, Meteorology, *Snow, *Storms, Synoptic analysis, Weather patterns, *Washington.
Identifiers: Avalanche research, Avalanche zoning, *Cascades (Wash).

Two snow storms which produced major avalanche cycles in Washington's Cascades are studied in detail. Approximately 850 avalanches were recorded during these storms, resulting in loss of life and property. The meteorological features of these storms are examined. The various ways in which the avalanche problem is being handled are discussed. These include special weather forecasts and avalanche warnings, the National Avalanche School, avalanche control measures, protective structures, avalanche zoning, and avalanche research. (Forest Service)
W74-00680

A CENTRIFUGAL TENSILE TESTER FOR SNOW,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
R. A. Sommerfeld, and F. Wolfe, Jr.
USDA Forest Service Research Note RM-227, 1972. 4 p, 3 fig, 6 ref.

Descriptors: *Avalanches, *Snow management,
*Tensile strength, Centrifugation, Stress.
Identifiers: *Snow avalanches.

A new centrifugal tensile tester has been designed for snow samples. The design incorporates the following unique features: constant stress rate, automatic turnoff, strip chart record of RPM, variable sample volume, and reduced sample damage. (Forest Service)
W74-00682

SIMULATED SONIC BOOM AS AN AVALANCHE TRIGGER,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
USDA Forest Service Research Note RM-224, 1972. 7 p, 5 fig, 2 tab, 10 ref.

Descriptors: *Avalanches, *Snowpacks, *Snow
cover.
Identifiers: *Sonic boom.

A linear array of detonating cord was used to simulate a sonic boom. The boom from such charges was directed toward the fracture zone of a small avalanche path where the snow was unstable, as indicated by natural avalanches in the area. On three of four tests, avalanches were released by a boom of 12 pounds per square foot (60 kg f/m²) over-pressure after withstanding lesser booms. One of the avalanches had a fracture face 8 feet 11 inches (272 cm) deep. (Forest Service)
W74-00683

SNOW FENCES FOR INFLUENCING SNOW ACCUMULATION,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.

In: Proceedings International Symposia on Role of Snow and Ice in Hydrology, Symposium on Measurement and Forecasting, Banff, Alberta, Canada, September 6-13, 1972. Sess. WMO-5. 6 p, 9 ref.

Descriptors: *Snow management, *Snowpacks,
Snow cover, Blizzards, *Colorado.
Identifiers: Blowing snow, *Snow fences, *Mount
Bethel (Colo).

The following items that influence the efficiency of collecting snow fences are discussed briefly: height, density and length of fence, bottom gap, length and maximum depth of lee drift, cumulative effect of a set of tandem fences, tilting of fence, terrain effects, and contributing distance. The snow fence project on Mount Bethel in Central Colorado is cited as a practical example of how some of the above items were used to design and lay out snow fences intended to reduce the amount of wind-blown snow deposited in the starting zone of an avalanche that crosses an interstate highway. (Forest Service)
W74-00684

WEATHER CONDITIONS THAT DETERMINE SNOW TRANSPORT DISTANCES AT A SITE IN WYOMING,

Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
R. D. Tabler, and R. A. Schmidt.

In: Proceedings, International Symposia on the
Role of Snow and Ice in Hydrology, Symposium on
Properties and Processes, Banff, Alberta, Canada, September 6-13 1972. 7 p, 4 fig, 6 ref.

Descriptors: Snow, *Sublimation, *Blizzards,
*Weather, Snow cover, Snow packs, Winds, Shelterbelts, Snowfall, Snow management, Wind-breaks, Water conservation, Water sources, Water balance, Watershed management, *Wyoming, Demonstration watersheds.

Identifiers: *Blowing snow, *Snow transport,
Snow drifting, Snow fences, Induced snow accumulation, *Snowdrifts.

A mathematical model for the sublimation of wind-blown snow has recently been published. In a simplified form, the model predicts the distance a particle of given size will travel before completely sublimating; critical variables are particle speed, relative humidity and temperature of the air, and total insolation. Measurements of these conditions, at a site in southeastern Wyoming (elevation 2500 meters) during all drifting events over the 1970-71 winter, indicate average transport distances of 460 and 900 meters, for particle diameters of 0.010 and 0.015 cm, respectively. (Forest Service)
W74-00685

SIMULATING EFFECTS OF HARVEST CUTTING ON SNOWMELT IN COLORADO SUBALPINE FOREST,

Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W74-00686

GENERALIZATION OF HAEFELI'S CREEP-ANGLE ANALYSIS,

Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.
R. I. Perla.

Journal of Glaciology, Vol 11, No 63, p 447-450,

1972. 2 fig, 5 ref.

Descriptors: Snowpacks, Avalanches, *Stress
analysis, Creep.
Identifiers: Snow mechanics, *Slab mechanics,
*Creep angle.

Using geometrical arguments, Haefeli developed a stress analysis for slabs of compressible viscous materials. His analysis was based on a key parameter called the creep angle. A generalization of the creep angle, called the deformation-rate coefficient, is derived by replacing geometrical arguments with continuum mechanics. Once the deformation-rate coefficient is found from in situ

Field 02—WATER CYCLE

Group 2C—Snow, Ice, and Frost

measurements, the stress field of the slab can be determined from a set of hyperbolic partial differential equations. (Forest Service)
W74-00687

EFFECT OF SNOW FENCE HEIGHT ON WIND SPEED,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 03B.
W74-00691

DESIGN OF A WATERSHED SNOW FENCE SYSTEM, AND FIRST-YEAR SNOW ACCUMULATIONS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 03B.
W74-00695

PHOTGRAMMETRIC DETERMINATIONS OF SNOW COVER EXTENT FROM UNCONTROLLED AERIAL PHOTOGRAPHS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 03B.
W74-00697

ISUA, GREENLAND: CALCULATIONS OF GLACIER FLOW FOR AN OPEN-PIT MINE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Research Report 309, July 1973. 24 p, 14 fig, 1 tab, 11 ref, append.

Descriptors: *Glaciers, *Flow, *Movement, *Mining, Rheology, Excavation, Mine water, Water balance.
Identifiers: *Greenland.

A large mineral deposit was discovered at Isua, in southwest Greenland. In addition to the usual problems of mining in the subarctic regions, the exploitation of this mineral resource is complicated by the fact that it lies at the edge of the Greenland Ice Cap. Most of the ore is covered by ice (up to 150 m thick) and, as the ice is stripped away to expose the ore, additional ice flow into the area of the pit is expected. The most favorable profile for the ice surface next to the open pit was calculated. Seven cross sections of flow were considered and in each case the flow characteristics of the most favorable profile were calculated: The results of these cross sections were averaged around the upstream edge of the pit in order to calculate the excavation necessary to establish a favorable profile and the yearly excavation necessary to maintain that profile. (Knapp-USGS)
W74-00818

A STUDY OF WINTER PRECIPITATION AREAS IN RELATION TO SEVERAL INDICATORS OF VERTICAL MOTION—CHAPTER I OF A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 02B.
W74-00852

CURRENT STATUS OF RESEARCH ON THE BIOLOGICAL EFFECTS OF PESTICIDES IN CHESAPEAKE BAY,
Wingsthouse Ocean Research Lab., Annapolis, Md.
For primary bibliographic entry see Field 02L.
W74-00923

DEVELOPMENT OF A SNOWMELT-RUNOFF MODEL FOR THE U.S. TUNDRA BIOME, PROGRESS REPORT,
S. L. Dingman.

International Biological Program, U.S. Tundra Biome Report 73-3, June 1973. 43 p, 10 fig, 4 tab, 14 ref, 4 append.

Descriptors: *Snowmelt, *Runoff, *Arctic, *Alaska, *Streamflow forecasting, Mathematical models, River basins, Equations, Dead storage, Topography, Flow rates, Snowpacks, Water equivalent.
Identifiers: *Barrow (Alaska).

Progress in applying a simple three-parameter equation to the simulation of snowmelt runoff on the Arctic Coastal Plain is described. The parameters are: (1) the amount of water held in 'dead storage' on the basin, S_2 ; (2) a timing parameter, K , that depends on the physical characteristics of the basin; and (3) a parameter, N , that depends on the mode of flow within the basin. The three parameters are best determined by examining streamflow records from the basin to be modeled. The equation is incorporated and tested in a series of three computer simulation programs of increasing complexity. The final form includes an accounting for varying water equivalents on varying proportions of the basin. The results of the tests of this model against measured snowmelt runoff from a 1.45 sq mi basin near Barrow, Alaska, indicate that the model is very promising, and should be tested and developed further. Data requirements, advantages, and disadvantages of the model are discussed. (Woodard-USGS)
W74-01094

2D. Evaporation and Transpiration

COMPUTATION OF MAXIMUM STORM RUNOFF FOR DESIGNING EROSION CONTROL STRUCTURES IN SOUTHWESTERN EUROPEAN RUSSIA (RASHET MAKSIMAL'NOGO LIV-NEVOGO STOKA PRI PROYEKTIROVANIYU PROTIVOEROZIONNYKH SOORUZHENIY V YUGO-ZAPADNOY CHASTI YETS),
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Kiev (USSR).
P. F. Vishnevskiy.

In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut. Trudy, No 100, p 92-104, Moscow, 1971. 4 fig, 3 tab, 9 ref.

Descriptors: *Watershed management, *Watersheds (Basins), *Erosion control, *Water yield, *Storm runoff, Overland flow, Slopes, Discharge (Water), Probability, Equations.
Identifiers: *European USSR, Traveltine, Nomograms.

The southwestern part of European Russia is located in a zone of intense rainfall activity. Heavy rains (100 mm or more) occur each year and cause severe gully erosion. Recommendations are developed for calculating maximum storm runoff in designing erosion control structures on eroded lands of natural watersheds. These recommendations can be used to calculate maximum discharges and storm-runoff volumes of varying probabilities for very small watersheds and channel-free slopes in southwestern regions of European Russia. (See also W74-00592) (Josefson-USGS)
W74-00600

EFFECTIVE AVAILABLE WATER AND ITS RELATION TO EVAPOTRANSPIRATION RATE, DEPTH OF WETTING, AND SOIL TEXTURE,
Agricultural Research Service, Prosser, Wash.
For primary bibliographic entry see Field 02G.
W74-00608

THE ROCKY MOUNTAIN MILLIVOLT INTEGRATOR FOR USE WITH SOLAR RADIATION SENSORS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. J. R. Thompson, and A. D. Ozment.
USDA Forest Service Research Note RM-225, 1972. 8 p, 8 fig, 11 ref.

Descriptors: *Electronic equipment, *Instrumentation, On-site data collections, Solar radiation.
Identifiers: *Solar radiation integrator, *Millivolt integrator.

Electronic integration of a radiometer's millivolt signal is a practical and accurate means of obtaining hourly, daily, weekly, or long-term radiation values. One such instrument has recently been designed and built by the Rocky Mountain Station. It consists of four printed circuit boards, a synchronous bi-directional stepper motor, and a five-decade counter. Each integrator is calibrated to match the millivolt output of the radiation sensor, so that the counter reads directly in langleys. The totalizing of a signal from a typical net radiometer (with a 6.20mv/langley output) would be within plus or minus 1 percent over most of the positive signal range, but could be 5 percent too low at night when the sensor output is negative. (Forest Service)
W74-00690

PRELIMINARY RESULTS OF WATER LEVEL CONTROL ON SMALL PLOTS IN A PEAT BOG,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 04A.
W74-00694

XYLEM WATER POTENTIALS AND STOMATAL RESISTANCE IN BOG PLANTS: ECOLOGICAL IMPLICATIONS,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 02I.
W74-00719

RELATIONSHIP OF TRANSPIRATION TO ATMOSPHERIC VAPOR PRESSURE,
Arizona Univ., Tucson.
F. D. Cole, and J. P. Decker.
Journal of the Arizona Academy of Science, Vol 8, No 2, p 74-75, June 1973, 2 fig, 5 ref.

Descriptors: *Transpiration, *Evapotranspiration, *Humidity, *Vapor pressure, Consumptive use, Plant growth, *Beans, Leaves.

Transpiration of illuminated bean plants was determined by measuring weight loss while plants were exposed to air of constant humidity, temperature, and circulation. The vapor pressure of water within the leaves was computed from internal temperatures measured with thermocouples. Vapor pressure of external air was measured directly by infrared gas analysis. Transpiration rate was then determined to be linear, but not a proportional function of the difference between these two vapor pressures. In a similar study using an atmometer instead of a plant, evaporation varied linearly and nearly proportionally with vapor pressure difference. The disproportionalities are interpreted as indicating that the temperature of the thermocouple consistently exceeded the temperature of the actual evaporating surface. The determination of this relationship of transpiration to atmospheric vapor pressure is especially significant in arid regions where water loss through transpiration is most important since such a relationship can help estimate the amount of water lost in this manner. (Muller-Arizona)
W74-00759

WATER CYCLE—Field 02

Streamflow and Runoff—Group 2E

THE USE OF TESIOMETERS AS INDICATORS OF SOIL MOISTURE AVAILABILITY FOR PLANTS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics.
For primary bibliographic entry see Field 03F.
W74-00989

NEW POINTS OF VIEW ON THE PHYTOGEOGRAPHIC POSITION OF THE HIGH ARDENNES, (IN GERMAN), W. VAN COTHEM.

Ghent Rijksuniversiteit (Belgium). Laboratorium voor Systematische Morfologie.

Biol Jaarb. 39 p 122-144. 1971, illus.
Identifiers: *Ardennes region, Belgium, Climates, *Evapotranspiration, France, Geographic, Luxembourg, Soils, Transpiration, Vegetation, "Phytogeographic position."

The exact phytogeographic position of the High Ardennes (France-Belgium-Luxembourg) has not been definitely determined. Some believe that the high Ardennes plateaus deserve the rank of a district, while others consider them as a subdistrict of the vast Ardennes district. It is not considered a separate district according to the Braun-Blanquet definition. It is suggested that data on potential evapotranspiration for different localities (Thornthwaite's climatic classification) would help establish direct relations between the vegetation, and soil and the climate.—Copyright 1973, Biological Abstracts, Inc.
W74-01025

2E. Streamflow and Runoff

TRAVEL TIME OF GEORGIA STREAMS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 04A.
W74-00556

RIVER MILE INDEX-NAPA, SALINAS, AND EEL RIVER BASINS, CALIFORNIA.
Federal Power Commission, San Francisco, Calif. Regional Office.

Pacific Southwest Inter-Agency Committee, Water Management Technical Subcommittee report, June 1973. 37 p, 2 fig.

Descriptors: *Distance, *River systems, *Indexing, *California, Documentation, River basins, Tributaries, Drainage area, Elevation.
Identifiers: *River mile index, *Pacific Southwest, Napa River basin (Calif), Salinas River basin (Calif), Eel River basin (Calif).

This river mile index for the Napa, Salinas and Eel River basins in California is one of a series of reports for stream basins in the Pacific Southwest. River mileages were determined from independent measurements made on U.S. Geological Survey topographic quadrangles. The U.S. Geological Survey furnished information on stream gage locations, drainage areas, and water elevations at key points. Streams are designated by order number to indicate their relationship in the basin network. First order streams are main stem streams with an outlet on the sea. Tributaries to these are second order, tributaries to second order are third order, etc. In making the index, the river mile distances were measured upstream from the mouth to the nearest tenth of a mile. (Woodard-USGS)
W74-00585

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN-VOLUME 2. COLORADO RIVER BASIN FROM GREEN RIVER TO COMPACT POINT.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.

W74-00586

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS-VOL 3. UPPER MISSISSIPPI RIVER BASIN BELOW KEOUK, IOWA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W74-00587

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN-VOLUME 4. OHIO RIVER BASIN BELOW WABASH RIVER.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W74-00588

STREAMFLOW FORMATION, COMPUTATIONS, AND REGULATION (FOR MIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04A.
W74-00592

PROCEDURES FOR COMPUTING MOVEMENT OF SPRING FLOW ALONG THE CASCADE OF RESERVOIRS ON THE DNEPER RIVER (METODIKA RASCHETA DVIZHENIYA VESENNEGO STOKA PO KASKADU VODOKHRANILISHCH NA DNEPRE),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04A.
W74-00593

EXPERIMENT IN CALCULATING MOVEMENT OF THE 1970 FLOOD WAVE ALONG THE CASCADE OF DNIPER RESERVOIRS (OPYT RASCHETA DVIZHENIYA VOLNY POLOVOD'YA 1970 G. PO KASKADU DNEPROVSKIH VODOKHRANILISHCH),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
I. A. Zheleznyak, L. B. Byshovets, and A. I. Shereshevskiy.
In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 23-30, Moscow, 1971. 3 fig, 1 tab, 4 ref.

Descriptors: *Flood waves, *Flood flow, *Flood routing, *Reservoirs, *Discharge (Water), Flood discharge, Stage-discharge relations, Hydrographs, Reservoir storage, Inflow, Gaging stations, Hydroelectric plants.
Identifiers: USSR, *Dnieper River.

Construction of reservoirs and operation of hydroelectric powerplants have altered the natural water regime of the Dnieper River. To compute flood-wave movement in reservoirs, a study was made of the 75-year flood which occurred on the Lower Dnieper between Kiev and Kakhovka in the spring of 1970. Factors responsible for the spring flood on all rivers forming inflow to the reservoir of the Kiev Hydroelectric Powerplant and to Kiev were analyzed. Computations were performed in many variants of water flow from inlet gaging stations on the Pripyat', Dnieper, Sozh, and Desna Rivers to Kakhovka. These include routing in 16 river reaches and 5 reservoirs by procedures developed to show the regulating effect of the reservoir cascade on spring runoff of the Lower Dnieper. Computation errors did not exceed 10% for over 50% of the outflow discharges in each reservoir and were within limits of 5% for about 40% of the discharges. (See also W74-00592) (Josefson-USGS)
W74-00594

SHORT-TERM FORECAST OF DAILY DISCHARGES OF THE DNEPER RIVER AT KIEV DURING THE PERIOD OF THE 1970 FLOOD (O KRATKOSROCHNOM PROGNOZE YEZHEDNEVNYKH RASKHODOV DNEPRA U KIEVA V PERIOD POLOVOD'YA 1970 G.),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04A.
W74-00595

CALCULATION OF SPRING RUNOFF DEPTH IN CARPATHIAN RIVERS (RASCHET SLOVA VESENNEGO STOKA REK KARPAT),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04A.
W74-00597

FLASH FLOODS ON CARPATHIAN RIVERS IN JUNE 1969 AND MAY 1970 (LIVNEVYYE PAVODKI NA REKAKH KARPAT V IYUNE 1969, MAYE 1970 G.),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
P. M. Lyutik.
In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 75-85, Moscow, 1971. 3 fig, 2 tab, 4 ref.

Descriptors: *Flash floods, Rivers, *Flood discharge, *Peak discharge, *Flood stages, Flood damage, Runoff, Runoff coefficient, Precipitation (Atmospheric), Hydrographs, Water levels.
Identifiers: USSR, *Ukraine, *Carpathian Mountains.

Catastrophic floods produced by continuous heavy rains occurred in the Dniester, Prut, Seret, and Tisza River basins in the Ukrainian Carpathians in Jun 1969 and May 1970. Heaviest rains occurred June 7-10, 1969, and the precipitation which fell in the Chernovtay, Ivano-Frankovsk, and L'vov Oblasts in June (200-400 mm) exceeded the average monthly value by more than 300%. The floods inundated populated areas, agricultural lands and livestock farms, and damaged railroads, highways, bridges, oil wells and fields, high-tension powerlines, gas mains, building enterprises, etc. Rainfall of a duration of 25-40 hours covered an area of about 22,000 sq km. Rains were heaviest in upper reaches of the Bystritsa Nadvornyan-skaya, Bystritsa Solotvinskaya, Lomnitsa, and Prut Rivers, where precipitation amounted to about 300 mm. Maximum flood stages and peak discharges were the highest recorded in the last 100 years on some reaches of the Stryy, Lomnitsa, Bystritsa Solotvinskaya, Bystritsa Nadvornyan-skaya and upper reaches of the Prut and Seret Rivers in June 1969 and on the Tisza River in May 1970. To study flood formation conditions and to determine peak discharges, investigations were carried out by the Ukrainian Hydrometeorological Scientific Research Institute and by hydrologic stations of the Ukrainian Hydrometeorological Service. Flood-discharge hydrographs were constructed, and flood duration and runoff depths and coefficients were determined. Flood characteristics on Carpathian rivers in June 1969 and peak discharges on Carpathian rivers in May 1970 are tabulated. (See also W74-00592) (Josefson-USGS)
W74-00598

FACTORS RESPONSIBLE FOR FLOODFLOW IN CARPATHIAN RIVERS (AS ILLUSTRATED BY THE STRYY AND BYSTRITSA RIVERS) (FAKTORY PAVODOCHNOGO STOKA KARPATSKIH REK (NA PRIMERS STRYYA I BYSTRITSY)),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
G. V. Pavlenko.

Field 02—WATER CYCLE

Group 2E—Streamflow and Runoff

In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 100, p 86-91, Moscow, 1971. 1 fig, 6 ref.

Descriptors: *Flood flow, *Floods, Rivers, *Tributaries, Watersheds (Basins), Surface-groundwater relationships, Rainfall-runoff relationships, Snowmelt, Soil moisture, Freezing, Seasonal.

Identifiers: *Ukraine, Carpathian Mountains, *Stry River (USSR), *Bystritsa River (USSR).

Flood formation conditions during warm and cold periods of the year were investigated on two large physiographically similar mountain tributaries of the Dniester River: Stry to Mezhibrod (drainage area--2,400 sq km) and Bystritsa to Yamnitsa (drainage area--2,450 sq km). Recommendations were developed for computing daily water yield from snow and rainwaters with allowance for basin elevation. A relation of runoff depth of rainfall and rainfall-snowmelt floods to daily water flow onto the basin surface, preflood groundwater discharge, soil moisture content, and depth of soil freezing was established for the Stry and Bystritsa Rivers. (See also W74-00592) (Josefson-USGS) W74-00599

ANNUAL STREAMFLOW SUMMARIES FROM FOUR SUBALPINE WATERSHEDS IN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W74-00676

WATER YIELD CHARACTERISTICS OF THREE SMALL WATERSHEDS IN THE NORTHEASTERN BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W74-00677

FLOW AND CHANNEL CHARACTERISTICS OF TWO HIGH MOUNTAIN STREAMS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W74-00678

CONTRIBUTIONS TO THE KNOWLEDGE OF BIOGENIC ELEMENTS AND PHYTOPLANKTON ASSOCIATIONS DYNAMICS IN FRASINET POND DURING NOVEMBER 1969-NOVEMBER 1970, (IN RUMANIAN),
For primary bibliographic entry see Field 05C.
W74-00727

COMPARISON OF FIELD METHODS FOR MEASURING STREAM DISCHARGE,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
R. Engstrom-Heg.
N Y Fish Game J. Vol 18, No 2, p 77-96, 1971, Illus.
Identifiers: Discharge, Field methods, Measurement, *Stream discharge, *Salt-dilution methods, *Gaging.

Stream discharges were measured by a modification of Emboddy's float method and by 2 salt-dilution methods using a specific conductivity meter. In one of the latter, salt solution was introduced from a plastic constant-flow carboy. In the other, salt was introduced by solution from pre-weighed salt blocks. A precise relationship between NaCl concentration, temperature and specific conductivity is given in nomographic form, permitting rapid determination of changes in salt concentration. Comparison with US Geological Survey

stream-gage readings showed that each method, when used in a suitable location, provided discharge measurements sufficiently accurate for most aquatic biological applications. The salt-dilution methods, in particular, can be used in very shallow, very turbulent and very sluggish streams where the more standard current-meter method is not applicable. Between them, the 3 methods described provide means for fairly rapid, easy and inexpensive gaging of the great majority of small and medium-sized streams.—Copyright 1973, Biological Abstracts, Inc.
W74-00735

BIBLIOGRAPHY OF REPORTS ON THE WATER RESOURCES OF INDIANA PREPARED BY THE U.S. GEOLOGICAL SURVEY, 1886-1972,
Geological Survey, Indianapolis, Ind.
M. J. Wilson.
Open-file report, 1973. 35 p, 1 fig, 3 tab.

Descriptors: *Bibliographies, *Water resources, *Water quality, *Indiana, Surface waters, Groundwater, Hydrologic data, Data collections, Streamflow, Flow rates, Aquifer characteristics, Water wells, Water yield, Water utilization, Hydrology, Hydrogeology, Chemical analysis, Water analysis, Water chemistry, Publications.
Identifiers: Water supply papers.

This bibliography contains a complete history to December 1972 of reports relating to the water resources of Indiana prepared by U.S. Geological Survey personnel. Many of the reports discuss related subjects of geology, hydrology, and chemical quality of the water. The bibliography is divided into three major parts: (1) publications of the U.S. Geological Survey; (2) open-file reports of the Geological Survey; and (3) other publications—reports prepared by Survey personnel but published by other agencies or by professional organizations in their journals. An index to the bibliography is included. Annual USGS water-supply papers are listed, by number and period of time covered, in three tables: (1) groundwater, (2) surface water, and (3) water quality. (Woodard-USGS)
W74-00814

NUMERICAL SIMULATION OF UNSTEADY FLOWS IN RIVERS AND RESERVOIRS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.

For primary bibliographic entry see Field 06B.
W74-00816

HEC-1, FLOOD HYDROGRAPH PACKAGE—USERS MANUAL, COMPUTER PROGRAM 723-X6-L2010.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-00821

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—USERS MANUAL.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-00822

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—PROGRAMMERS MANUAL.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-00823

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 1. SURFACE WATER RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 07C.
W74-00825

FLOOD STUDIES,

Bureau of Reclamation, Denver, Colo. Flood Hydrology Section.
For primary bibliographic entry see Field 08A.
W74-01061

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE UPPER COLORADO RIVER BASIN, TEXAS, APRIL 8, 1968,
Geological Survey, Austin, Tex.

J. Rawson.
Texas District open-file report, September 1973, 24 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Base flow, Flow rates, *Water quality, *Texas, Streamflow, Chemical analysis, Basic data collections, Drainage area, Geology, Stream gages, Water analysis, Water chemistry, Geochemistry, Surface-groundwater relationships, *Low flow, Salinity, *Dissolved solids.
Identifiers: *Colorado River basin (Tex.).

Changes are defined in the quantity and quality of flow in a 103.2-mile reach of the Colorado River below Lake J. B. Thomas on April 8, 1968, a period when most of the flow was sustained by groundwater effluent. Flow in the reach increased from zero at mile 836.6 to 5.53 cfs at mile 733.4. Measured inflow from tributaries totaled 5.81 cfs. Thus, the interchange of surface and groundwater in the main-stem Colorado River resulted in a net loss of 0.28 cfs. The interchange of surface water and groundwater in the reach, supplemented by the inflow from tributaries, resulted in a net decrease in the concentration of dissolved solids from 16,900 mg/liter at mile 826.3 to 4,140 mg/liter at mile 733.4. However, significant increases in the concentration of dissolved solids occurred within some of the subreaches. The largest increase occurred in the subreach between mile 813.4 and mile 796.3 which is underlain by the Dockum Group. Dissolved solids in this subreach increased from 3,600 mg/liter at the upstream end of the reach to 6,660 mg/liter at the downstream end. (Woodard-USGS)
W74-01090

HEC-4, MONTHLY STREAMFLOW SIMULATION, COMPUTER PROGRAM 723-X6-L2340.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-01091

2F. Groundwater

GROUND WATER, A RESOURCE TO BE PROTECTED,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 05B.
W74-00566

THE NATIONAL QUALITY OF GROUND WATER IN MINNESOTA,
Geological Survey, St. Paul, Minn.
T. C. Winter.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 11-29, February 1973. 9 fig, 13 ref. 14-31-0001-3823.

Descriptors: *Water quality, *Groundwater, *Minnesota, Water chemistry, Water analysis, Water resources development, Water management (Applied), Data collections, Hydrologic data.

Groundwater occurs in four hydrogeologic environments in Minnesota; fractures in crystalline rocks, Paleozoic sedimentary rocks, Cretaceous sedimentary rocks, and glacial drift. The chemical

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and mineralogic properties of these rocks and the movement of water through them results in the occurrence of distinct water-quality types in the State. Chemical analyses of ground water samples collected throughout the State were classified by a graphical technique. Calcium-magnesium bicarbonate type water occurs throughout the State and predominates in the eastern three-fourths. Calcium-magnesium sulfate, sodium bicarbonate, and sodium chloride types of groundwater occur in complex vertical and areal relationships in western Minnesota. The occurrence of water having dissolved-solids content greater than 1,000 milligrams per liter is limited largely to northwest and southwest Minnesota, where water types other than calcium-magnesium bicarbonate are common. (See also W73-09113) (Knapp-USGS)
W74-00567

HYDROGEOLOGIC FRAMEWORK FOR DETERIORATION IN GROUNDWATER QUALITY,

Minnesota Univ., St. Paul. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W74-00569

GROUND WATER QUALITY INFORMATION SYSTEMS - EXPERIENCES IN OTHER STATES,

Minnesota Univ., Minneapolis. School of Public Health.
For primary bibliographic entry see Field 07C.
W74-00576

WATER RECHARGE IN A SOIL WITH SHRINKAGE CRACKS,

Hohenheim Univ., Stuttgart-Hohenheim (West Germany).
For primary bibliographic entry see Field 02G.
W74-00602

GROUNDWATER RESOURCES OF THE USSR (RESURSY PODZEMNYKH VOD SSSR),

All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
N. I. Plotnikov.
Vodnye Resursy, No 1, p 140-150, 1973. 3 tab.

Descriptors: *Groundwater resources, *Groundwater availability, *Freshwater, *Water supply, Groundwater mining, Safe yield, Water demand, Water users, Irrigation, Water utilization, Withdrawal, Exploitation, Exploration, Hydrogeology, Forecasting.
Identifiers: *USSR.

Distribution of fresh groundwater in the USSR is extremely uneven. Primary known sources of fresh groundwater are located in artesian basins of platforms and geosynclines; sandy-gravelly deposits of river valleys and piedmont alluvial fans; sandy-gravelly fluvioglacial formations; and in carbonate rocks. Present fresh groundwater use in the USSR relative to total known resources is about 6%. For individual Union Republics, the percentage is much higher: Armenia (96%), Turkmenistan (77%), Moldavia (75%), Azerbaijan (52%), and the Ukraine (36%). A large amount of fresh groundwater (313 cu m/sec) is used to meet domestic, municipal, and industrial water supply demands. Water supplied to over 62% of Soviet cities is derived entirely from the groundwater reservoir. Groundwater withdrawals for urban water supply are 150 cu m/sec in the RSFSR, 50 cu m/sec in the Ukraine, 20 cu m/sec in Uzbekistan, 16 cu m/sec in Kazakhstan, 12 cu m/sec in Belarusia and Georgia, and about 10 cu m/sec in Armenia. According to incomplete figures, fresh groundwater withdrawals for irrigation total 300 cu m/sec, including 130 cu m/sec in the Ukraine, 60 cu m/sec in Azerbaijan, 38 cu m/sec in Ar-

menia, about 25 cu m/sec in Tadzhikistan, and about 16 cu m/sec in Uzbekistan. Known fresh groundwater resources in the USSR and degree of their exploration and use by Union Republics are tabulated, and basic trends in the development of hydrogeology and problems confronting the Hydrogeological Service of the USSR are outlined. (Josefson-USGS)
W74-00845

PATTERNS OF LONG-TERM NATURAL FLUCTUATIONS OF GROUNDWATER LEVELS (ZAKOMERENOSTI MNOGOLETNIKH YESTESTVENNYKH KOLEBANIY UROVNEY PODZEMNYKH VOD),

Akademicheskii Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. S. Kovalevskiy.
Vodnye Resursy, No 1, p 161-177, 1973. 10 fig, 18 ref.

Descriptors: *Groundwater movement, *Water level fluctuations, *Water table, Aquifers, Zone of aeration, Depth, Hydrogeology, Cycles, Correlation analysis, Histograms, Forecasting.
Identifiers: *USSR.

Analysis of long-term groundwater-level fluctuations is usually reduced to a determination of possible long-term changes in aquifer thicknesses or possible changes in groundwater depths. The extent of long-term fluctuations depends on the relation of the aquifer to the ground surface and on the hydrogeology, geological structure, geomorphology, microrelief, and climatic conditions of the region. Long-term cyclic fluctuations of groundwater levels have no strict periodicity in time, and cycle designations are arbitrary. For forecasting, the presence of clear groupings of successive low- and high-water years must be established. Relation of seasonal annual and long-term average annual ranges of groundwater-level fluctuations depends on the thickness of the zone of aeration. Ranges of long-term groundwater-level fluctuations are generally directly proportional to the length of the cycle period. Small (2, 3 and even 5-7 year) cycles are observed in loose deposits whenever groundwater depths are shallow or conditions are favorable for infiltration of precipitation through the zone of aeration. In the USSR, the role of small cycles decreases and the role of large cycles increases from north to south with the gradual increase in average depths to the groundwater surface in the same direction. There is no synchronous occurrence of long-term extreme groundwater-level values. (Josefson-USGS)
W74-00846

POSSIBILITIES OF USING GEOPHYSICAL METHODS IN A STUDY OF FRESHWATER DISCHARGES IN LITTORAL ZONES OF SEAS (O VOZMOZHINOSTYAKH GEOFIZICHESKIKH METODOV PRI IZUCHENII RAZGRUZOK PRESNYKH VOD V PРИРЕЗНЬИХ ZONAKH MOREY),

Moscow State Univ. (USSR).
V. A. Bogoslovskiy, and A. A. Ogil'vi.
Vodnye Resursy, No 1, p 178-185, 1973. 2 fig, 1 tab, 4 ref.

Descriptors: *Submarine springs, *Discharge (Water), Freshwater, *Analytical techniques, *Geophysics, Electrical studies, Geothermal studies, Borehole geophysics, Electrical well logging, Electrodes, Resistivity, Electrical resistance, Resistance, Rock properties, Bottom sediments, Sea water, Littoral, Subsurface mapping.
Identifiers: *Odessa (USSR), *Abkhazia (USSR).

Application of electric and thermometric geophysical methods to a study of submarine springs, and characteristics and techniques of marine geophysical investigations are described. Investigations performed in the region of Odessa

and near Gantidi village (Abkhazia) show that thermometric and electric methods can be used to effectively map submarine springs and to study conditions of their discharge. (Josefson-USGS)
W74-00847

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME I.

Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00888

GROUND WATER POLLUTION AND CONSERVATION,

For primary bibliographic entry see Field 04B.
W74-00938

DEAD END PORE VOLUME AND DISPERSION IN POROUS MEDIA,

Jersey Production Research Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W74-00951

A STOCHASTIC MODEL FOR PREDICTING VARIATIONS IN RESERVOIR ROCK PROPERTIES,

Alberta Univ., Calgary.
For primary bibliographic entry see Field 08E.
W74-00955

BOREHOLE LOGGING INVESTIGATIONS IN THE CHALK OF THE LAMBOURN AND WINTERBOURNE VALLEYS OF BERKSHIRE,

Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 08G.
W74-00956

2G. Water in Soils

WATER RECHARGE IN A SOIL WITH SHRINKAGE CRACKS,

Hohenheim Univ., Stuttgart-Hohenheim (West Germany).
G. Blake, E. Schlichting, and U. Zimmermann.
Soil Science Society of America Proceedings, Vol 37, No 5, p 669-672, September-October 1973. 4 fig, 2 tab, 8 ref.

Descriptors: *Infiltration, *Recharge, *Soil water movement, Interstices, Tracers, Soil physical properties, Tritium, Expansive soils, Shrinkage, Permeability, Hydraulic conductivity.
Identifiers: *Shrinkage cracks.

Flow of water was studied in a relatively dry Pelosol characterized by fine shrinkage cracks between pedes. The coefficient of linear expansion was 0.115 in pedes of the Bva horizon between oven dryness and 0.3-bar moisture content. After a prolonged period in which evapotranspiration exceeded rainfall, 200 micro Ci of tritium were added with 100 liters of water to a plot 1.4 by 1.4 m. Replicated soil samples were taken after 24 hours and again 14 days later. Tritiated water was not confined to surface layers, about half being found below the 20-cm depth. Small amounts were found to the 100/cm sampling depth. Tritiated water did not wet the surface layers to the 0.3-bar percentage. Water additions of 765 mm applied to an adjoining plot over a period of 1 month showed gradual accumulation in the surface horizons of the profile rather than wetting to field capacity in layers that wet from the soil surface downward. These results are interpreted to indicate that water flowed down fine cracks in A and B horizons as free water, some of it soaking into the ped walls, or running into the C horizon. This was confirmed by measurements of the tritium concentration on

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crack walls. It was significantly higher on ped surface in the Bva horizon than in soil taken from within the ped. (Knapp-USGS)
W74-00602

VERTICAL INFILTRATION INTO A LAYERED SOIL,
Connecticut Agricultural Experiment Station,
New Haven. Dept. of Ecology.
D. E. Ayler, and J.-V. Parlange.
Soil Science Society of America Proceedings, Vol
37, No. 5, p 673-676, September-October 1973.
3 fig, 8 ref.

Descriptors: *Infiltration, *Unsaturated flow,
*Soil horizons, *Equations, Anisotropy, Soil
structure, Soil physical properties, Mathematical
studies, Wetting, Saturated flow, Hydraulic
conductivity.

An analytical model describes the soil moisture profiles for vertical infiltration into a layered soil (a fine textured layer over a coarser layer). For the case of constant imposed flux of water at the surface, the effect of an initial soil moisture content that increases with depth causes a steepening of the moisture profile; and the effect of the discontinuity in soil texture at the interface causes an accumulation of water above the interface in the fine textured soil. The technique is easy to apply and gives results which are in good agreement with experiment and substantially better than those obtained by computer simulation. (Knapp-USGS)
W74-00603

PROPAGATION OF SINUSOIDAL SOLUTE DENSITY OSCILLATIONS IN THE MOBILE AND STAGNANT PHASES OF A SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
P. A. C. Raats.
Soil Science Society of America Proceedings, Vol
37, No. 5, p 676-680, September-October 1973.
3 fig, 6 ref.

Descriptors: *Soil water movement, *Leaching,
*Path of pollutants, *Soil structure, Absorption,
Ion exchange, Equations, Pores, Solutes, Translocation,
Ion transport.

The propagation of a sinusoidal solute density oscillation in soil water movement is analyzed in terms of its absorption coefficient, phase shift factor, and speed. In order to account for the structure of a soil, solute may be considered to be divided between a mobile phase and stagnant phase. The mobile phase may correspond to the solution in a system of large pores and is assumed to move at a uniform, constant velocity in a certain direction. The stagnant phase may correspond to the solution in a system of small pores. The distribution and exchange of solute between the mobile and stagnant phases is assumed to be described by the ratio of the capabilities of the two phases to store solute and finite response time. The model shows clearly that the solute tends to bypass the stagnant phase. The results suggest several methods for measuring the parameters describing the interaction between the soil and the solute, and are of interest with regard to leaching of fertilizers and organic chemicals applied at the soil surface. (Knapp-USGS)
W74-00604

UNSTABLE WETTING FRONTS IN UNIFORM AND NONUNIFORM SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
P. A. C. Raats.
Soil Science Society of America Proceedings, Vol
37, No. 5, p 681-685, September-October 1973.
1 fig, 18 ref.

Descriptors: *Infiltration, *Wetting, *Soil water
movement, Unsaturated flow, Anisotropy, Soil
horizons, Hydraulic conductivity, Soil physical
properties, Equations.

If the velocity of a plane wetting front increases with depth of penetration, then the front will be unstable, and a small perturbation of an initially planar front will tend to grow. On the basis of a simple hydraulic model due to Green and Ampt, criteria for instability were derived. Decreases of depth of ponding and of capillary pressure head at the wetting front, increases with depth of the hydraulic conductivity and the initial water content, and compression of soil air ahead of the wetting front all have the effect of enhancing instability of the wetting front. The capillary pressure head at the wetting front is proportional to the surface tension and the cosine of the angle of contact of the water-air-soil interface and inversely proportional to the radius of curvature of the air-water interface, which in turn is proportional to the mean size of the soil particles. The analysis is extended to nonuniform soils. Criteria for instability of flows in layered soils and soils with crusts are included as special cases. (Knapp-USGS)
W74-00605

DISSOLVED ALUMINUM IN ACID SULFATE SOILS AND ACID MINE WATERS,
Agricultural Univ., Wageningen (Netherlands).
Dept. of Soil and Science and Geology.
For primary bibliographic entry see Field 05B.
W74-00607

EFFECTIVE AVAILABLE WATER AND ITS RELATION TO EVAPOTRANSPIRATION RATE, DEPTH OF WETTING, AND SOIL TEXTURE,
Agricultural Research Service, Prosser, Wash.
D. E. Miller, and J. S. Aarstad.
Soil Science Society of America Proceedings, Vol
37, No. 5, p 763-766, September-October 1973. 6
fig, 3 tab, 6 ref.

Descriptors: *Soil moisture, *Available water,
*Evapotranspiration, Field capacity, Moisture
content, Drainage, Irrigation.

The effect of evapotranspiration (Et) rate on effective available water (EAW) was evaluated for three soils ranging in texture from sand to silt loam, at evapotranspiration rates of about 0.4 to 1.3 cm per day, and at two depths of wetting. In all cases, as evapotranspiration rate increased, drainage following irrigation decreased and as a result EAW increased. The increase in EAW due to Et rate was relatively greater in the sand than in the finer textured soils. If only midsummer Et rates are considered, EAW may be estimated quite well from a field capacity test, provided soil depth and soil texture are considered in determining the sampling time for characterizing field capacity. If usable water is referenced to some safe depletion level rather than to the 15-bar percentage, the effect of Et is more important. EAW is influenced differently by depth of wetting in different textured soils. (Knapp-USGS)
W74-00608

SALTS IN IRRIGATION DRAINAGE WATERS: I. EFFECTS OF IRRIGATION WATER COMPOSITION, LEACHING FRACTION, AND TIME YEAR ON THE SALT COMPOSITIONS OF IRRIGATION DRAINAGE WATERS,
Agricultural Research Service, Riverside, Calif.
Salinity Lab.
For primary bibliographic entry see Field 05C.
W74-00609

EFFECT OF FOREST COVER REMOVAL ON DEPTH OF SOIL FREEZING AND OVERLAND FLOW,
Forest Service (USDA), La Crosse, Wis.
Watershed Lab.
R. S. Sartz.

Soil Science Society of America Proceedings, Vol
37, No. 5, p 774-777, September-October 1973. 4
fig, 4 tab, 9 ref.

Descriptors: *Frost, *Overland flow, *Infiltration,
*Clear-cutting, Water yield improvement, Forest
management, Rainfall-runoff relationships,
Vegetation effects, Watershed management,
*Wisconsin.

Depth of soil freezing and overland flow were measured under four hardwood forest conditions in southwestern Wisconsin: woody vegetation cut and removed; all vegetation cut and removed; uncut forest with litter removed; and undisturbed forest. Removing only the litter and removing all the vegetation increased both soil freezing depth and overland flow. Removing only the woody vegetation decreased both. Frost depth means, in a year of deep frost, were 6 and 11 cm on the woody vegetation removed and undisturbed plots, and 19 and 35 cm on the all vegetation-removed and litter-removed plots. Overland flow values ranged from less than 1 cm on the woody vegetation-removed plots to more than 7 cm on the all vegetation-removed and litter-removed plots. The increases in frost depth and overland flow appeared to be related to changes in soil bulk density and porosity. (Knapp-USGS)
W74-00610

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: I. THEORY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics.
E. Bresler.

Soil Science Society of America Proceedings, Vol
37, No. 5, p 663-669, September-October 1973. 4
fig, 1 tab, 22 ref.

Descriptors: *Dispersion, *Soil water movement,
*Ion exchange, *Osmosis, *Ion transport, Mathematical
models, Numerical analysis, Clay, Simulation
analysis, Unsaturated flow, Adsorption.

A simulation model for the simultaneous transport of anions and water takes into account physicochemical interaction between the solutes and the soil matrix. The effects of convection, ionic diffusion, mechanical dispersion, anion exclusion (negative adsorption), and coupling phenomena are considered jointly. The dependence of the osmotic efficiency coefficient and anion exclusion of soil water content and solution concentration are estimated from diffus double-layer theory and hydrodynamic considerations. These estimates compare favorably with available data on clays and soils. The nonsteady flow equations are solved by a numerical approach that eliminates numerical dispersion. An infiltration experiment was characterized by relatively high water contents and rapid flow; this showed that osmotic gradients are of minor importance. A slight anion exclusion brought about some improvement in the comparison between the theoretical data. (Knapp-USGS)
W74-00611

DEGRADATION OF CHLORINATED HYDROCARBONS BY CLOSTRIDIUM SP. ISOLATED FROM LINDANE-AMENDED, FLOODED SOIL,
Central Rice Research Inst., Cuttack (India).
For primary bibliographic entry see Field 05B.
W74-00664

WHEAT RESPONSE TO SOIL MOISTURE AND THE OPTIMAL IRRIGATION POLICY UNDER CONDITIONS OF UNSTABLE RAINFALL,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 03F.
W74-00669

GENERALIZATION OF HAEFELI'S CREEP-ANGLE ANALYSIS,
Forest Service (USDA), Fort Collins, Colo. Rocky
Mountain Forest and Range Experiment Station.

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For primary bibliographic entry see Field 02C.
W74-00687

SOIL WATER DEPLETION BY A HARDWOOD FOREST IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.

For primary bibliographic entry see Field 03B.
W74-00693

VEGETATION CHANGES AS A RESULT OF SOIL RIPPING ON THE RIO PUERCO IN NEW MEXICO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W74-00696

IMPORTANCE, STATUS, AND BASIC PROBLEMS OF STUDIES IN PHYSICS OF SOIL WATER (ZNACHENIYE ISSLEDOVANIY FIZIKI POCHVENNYKH VOD, IKH SOVREMENNYYE SOSTOYANIYE I OSNOVNYYE ZADACHI),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. I. Budagovskiy.
Vodnyye Resursy, No. 1, p 76-94, 1973. 39 ref.

Descriptors: *Soil physics, *Soil water, *Soil water movement, *Soil-water-plant relationships, *Evapotranspiration, Infiltration, Unsaturated flow, Porosity, Porous media, Model studies, Equations.

Identifiers: USSR, Water exchange.

Concepts and present state of knowledge of the physics of soil water are examined. Basic problems of investigations are movement of water in unsaturated porous media, and total evaporation and its components (transpiration of plants and evaporation from the soil). Ways of solving these problems are discussed, and individual applications of research results that show promise in the immediate years ahead are considered. (Josephson-USGS)
W74-00843

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME I.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00888

ORGANIC MATTER COMPOSITION UNDER DIFFERENT FOREST TYPES IN A DERNO-PODZOLIC ZONE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Pedology.
For primary bibliographic entry see Field 02K.
W74-00984

VARIATION OF ABSORBED BASE COMPOSITION IN SODIC SOILS OF THE KARABACH PLAIN UNDER WATER FLUSH WITH AND WITHOUT THE ELECTRIC CURRENT, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
A. M. Shestopalov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 4, p 78-81. 1972. (English summary).

Identifiers: Electric current, Gypsum, Plains, *Sodic soils, *USSR (Karabach plains), *Water flush, Absorption.

The effect of water flush on the variation of exchangeable bases composition of sodic soil remains the same when the electric current of gypsum was applied. The electric current increased the effect of gypsum on the exchangeable bases.--Copyright 1973, Biological Abstracts, Inc.

W74-00985

SOIL OF NORTH DAGESTAN, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Geography; and Moscow State Univ. (USSR). Dept. of Soil.

G. V. Dobrovolskii, K. N. Fedorov, and N. V.

Stasyuk.

Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 4, p 87-94. 1972. (English summary).

Identifiers: Alkaline soils, Carbonaceous soils, Gypsum, Humic Acid, Moisture, Nitrogen, Potassium, *Soils, *USSR (Gagestan), Organic compounds.

The soils of North Dagestan, USSR, possess a range of zonal characteristics: carbonaceous, alkaline, high in gypsum content and available K and N, but low in available P. Humus is rich in humic acid and insoluble organic compounds. These soils differ in their degree of hydromorphic alkalinity, moisture and physical properties.--Copyright 1973, Biological Abstracts, Inc.
W74-00986

A SIMPLE METHOD TO MEASURE THE PENETROMETER-RESISTANCE OF THE SOIL AND THE RELATIONSHIP BETWEEN THIS RESISTANCE, SOIL POROSITY AND SOIL WATER CONTENT,

L. De Leenheer.

Meded Fac Landbouwwet Rijksuniv Gent. Vol 37, No 1, p 1-7. 1972. Illus. (English summary).

Identifiers: Measurement, *Penetrometer resistance, *Soil water, *Soil porosity.

In silt soil a highly significant regression was found between the data for 2 depths, for the relationship with total soil porosity and soil water content. The method is described.--Copyright 1973, Biological Abstracts, Inc.
W74-00987

EFFECT OF THE POLYMER K-4 ON THE RESISTANCE OF LIGHT CHESTNUT SOIL COVER TO EROSION BY WATER, (IN RUSSIAN),

Moscow State Univ. (USSR). Dept. of Physics.
For primary bibliographic entry see Field 04D.

W74-00988

VARIATION IN SOIL FACTORS AND CROP YIELD ON A SANDY SOIL RICH IN ORGANIC MATTER, (IN NORWEGIAN),

For primary bibliographic entry see Field 03F.

W74-01051

SEEPAGE FLOWS—FIELD DATA MEASUREMENTS FOR EVALUATION OF POTENTIAL CONTRIBUTION OF FERTILIZERS TO GROUNDWATER POLLUTION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.

For primary bibliographic entry see Field 05B.

W74-01054

EFFECT OF DETERGENT APPLICATION ON THE GROWTH OF CORN,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.

For primary bibliographic entry see Field 03C.

W74-01057

ON THE STELLARIO-ALNETUM GLUTINOSAE (MIKYSKA 1944) LOHMEYER 1957 IN THE CZECH SOCIALISTIC REPUBLIC (CSR),

Ceskoslovenska Akademie Ved, Prague. Biologicky Ustav.

For primary bibliographic entry see Field 02I.

W74-01078

AN EQUATION FOR DESCRIBING WATER VAPOR ABSORPTION ISOTHERMS OF SOILS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

D. H. Fink, and R. D. Jackson.

Soil Science, Vol 116, No 4, p 256-261, October 1973. 2 fig, 1 tab, 22 ref.

Descriptors: *Adsorption, *Water vapor, Soil moisture, Soil water movement, Diffusion, Equations, Isotherms.

An adsorption isotherm equation describes sigmoid Type II adsorption isotherms such as the adsorption of water on soils and clays. The equation was statistically evaluated on 52 published adsorption isotherms; 49 of the 52 had correlation coefficients greater than 0.99, and the lowest was 0.96. The equation also can predict the complete isotherm from only a few scattered data points. Other uses include differentiation of the isotherm as is needed in vapor diffusion studies, and integration of the isotherm as is needed in certain thermodynamic relationships associated with the adsorption of vapors on soil surfaces. (Knapp-USGS)
W74-01087

MOVEMENT OF SALT AND WATER IN RELATIVELY DRY SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.

J-Y. Parlange.

Soil Science, Vol 116, No 4, p 249-255, October 1973. 4 fig, 9 ref.

Descriptors: *Soil water movement, *Solutes, *Diffusion, *Salts, Fertilizers, Path of pollutants, Osmosis, Mass transfer, Soil moisture.

When the surface of a relatively dry soil is covered with salt crystals, a wet layer containing salt in solution grows under the crystals. The water in the wet layer has little movement and salt diffuses into it from the surface. Water and salt concentration vary almost discontinuously between the wet layer and the drier soil underneath. These discontinuities are maintained by a strong osmotic potential which affects water movement in the vapor phase. (Knapp-USGS)
W74-01088

2H. Lakes

A EUTROPHICATION MODEL OF THE WHITE RIVER BASIN ABOVE BEAVER RESERVOIR IN NORTHWEST ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Civil Engineering.

For primary bibliographic entry see Field 05C.

W74-00555

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESHWATER ALGAE: AN EXPERIMENTAL STUDY. IV. GROWTH OF TEST SPECIES IN NATURAL LAKE WATERS, AND CONCLUSION,
Michigan State Univ., East Lansing. Dept. of Botany.

For primary bibliographic entry see Field 05C.

W74-00641

THE STANDING CROP AND PRIMARY PRODUCTIVITY OF THE PHYTOPLANKTON OF ABBOT'S POND, NORTH SOMERSET,
Bristol Univ. (England). Dept. of Botany.

For primary bibliographic entry see Field 05C.

W74-00651

Field 02—WATER CYCLE

Group 2H—Lakes

ALGAE ABSTRACTS, A GUIDE TO THE LITERATURE, VOLUME 1 TO 1969; VOLUME 2, 1970-1972.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05C.
W74-00704

LAKE WASHINGTON,
For primary bibliographic entry see Field 05C.
W74-00739

PROJECT REPORT FOR VENTURA COUNTY PLANNING DEPARTMENT AND CASITAS MUNICIPAL WATER DISTRICT ON WATERSHED DEVELOPMENT IMPACT ON LAKE CASITAS.
Montgomery Research, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 05B.
W74-00752

CHEMICAL AND BIOLOGICAL PATTERNS IN THE LOWER COLORADO RIVER SYSTEM,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 05C.
W74-00760

SOME COMPARISONS IN THE THERMAL STRUCTURE OF LAKES WOOD, KALAMALKA, OKANAGAN, SKAHA, AND OSOYOOS, BRITISH COLUMBIA,
Department of the Environment, Burlington (Ontario), Centre for Inland Waters.
J. O. Blanton.

Journal of the Fisheries Research Board of Canada, Vol 30, No 7, p 917-925, July 1973. 6 fig, 5 tab, 8 ref.

Descriptors: *Lakes, *Canada, *Epilimnion, *Hypolimnion, *Heat transfer, *Thermocline, *Thermal capacity, *Seasonal, Thermal properties, Aquatic life, Fish, Influent streams, Inflow, Groundwater, Surface waters, Limnology, Aquatic environment, Freshwater, Hydrology.
Identifiers: Lake Wood (Canada), Lake Kalamalka (Canada), Lake Okanagan (Canada), Lake Skaha (Canada), Lake Osoyoos (Canada).

The rate of change of heat contents in five British Columbian lakes was investigated, and the relative ability of each lake to transfer heat vertically to warm its hypolimnion was studied. Rates of hypolimnion heatup ranged from 0.06 C per month in Okanagan to 0.54 C per month in the north basin of Osoyoos. All lakes reached maximum static stability through the thermocline in late August, except for northern Osoyoos which reached its maximum somewhat earlier. Maximum heat contents ranged from 18,100 cal/sq cm in Wood Lake to 33,300 cal/sq cm in Lake Okanagan. Maximum heat content values were observed in late August in all lakes. A direct relationship was found between the hypolimnetic warming rates and the maximum stability in the thermocline regions. However, the relatively low rate of Lake Wood implies an external cooling source, such as groundwater influx. The late summer increase in epilimnion volume in Lake Wood and the corresponding entrainment of nutrients from the hypolimnion to the epilimnion appear to control the amount of production observed at that time.
(Brown-IPC)
W74-00769

OBSERVATIONS OF LANGMUIR CIRCULATIONS IN LAKE ONTARIO,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris, and J. N. A. Lott.
Limnology and Oceanography, Vol 18, No 4, p 584-589, July 1973. 5 fig, 1 tab, 18 ref.

Descriptors: *Lake Ontario, *Water circulation, *Currents (Water), Winds, Waves (Water), Convection.
Identifiers: *Langmuir circulation.

The downwelling velocities associated with Langmuir circulations in Lake Ontario correlate well with wind speed under surface cooling. With surface heating the correlations with wind speed are poor and calculations of a stability parameter indicate a different proportionality. Surface slicks and capillary wave damping are in operation at the point of downwelling. (Knapp-USGS)
W74-00831

BIOLOGICAL INVESTIGATIONS OF LAKE WINGRA,
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 05C.
W74-00833

SOME IMPORTANT PROBLEMS IN MODERN LIMNOLOGY (O NEKOTORYKH VAZHNYKH ZADACHAKH SOVREMENNOGO OZEROVEDENIYA),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
S. V. Kalesnik.
Vodnyye Resursy, No 1, p 36-42, 1973.

Descriptors: *Limnology, *Lakes, Freshwater, Water levels, Water balance, Eutrophication, Water pollution effects, Forecasting.
Identifiers: *USSR.

The varied role of lakes in the Soviet economy is described, and relations between lakes and the surrounding environment are examined. Basic problems in modern limnology are discussed with emphasis on application of complex methods of investigation. These problems include determination of total water balance of freshwater lakes in the USSR; study of cyclic water-level fluctuations of lakes; control of lake pollution and eutrophication; and forecast of lake changes. To solve these problems, training of manpower for research is indicated. (Josefson-USGS)
W74-00839

HYDROCHEMICAL ZONALITY OF URAL LAKES (GIDROKhimICHESkAYA ZONAL'NOST' OZER URALa),
M. N. Yeremeyeva, L. Ye. Chernyayeva, and A. M. Chernyayev.
Vodnyye Resursy, No 1, p 43-54, 1973. 1 fig, 9 tab, 2 ref.

Descriptors: *Lakes, *Limnology, *Water chemistry, *Inorganic compounds, *Water types, Water quality, Water analysis, Correlation analysis, Maps.
Identifiers: USSR, *Ural area.

Data on chemical composition of lake waters in the Ural area are based on approximately 3,000 chemical analyses of water samples obtained from hydrochemical investigations of more than 700 different lakes in 1956-71. By degree of mineralization, Ural lakes are classified into 5 categories: (1) freshwater lakes with a total mineralization less than 0.5 g/liter; (2) freshwater lakes with a total mineralization between 0.5 and 1 g/liter; (3) brackish-water lakes with a total mineralization between 1 and 5 g/liter; (4) saline lakes with a total mineralization between 5 and 35 g/liter; and (5) brine lakes with a total mineralization greater than 35 g/liter. Six hydrochemical lake zones are identified in the Ural area and adjoining regions: (1) zone of bicarbonate freshwater; (2) zone of bicarbonate-chloride freshwater and, occasionally, brackish water; (3) zone of chloride-bicarbonate brackish water; (4) zone of chloride-sulfate saline water; (5) zone of chloride saline and brine waters; and (6) zone of waters of varied

chemical composition and mineralization. Hydrochemical zonality of lakes in the area is mapped, and parameters of lognormal distribution of Ca, Mg, Na+K, HCO₃, SO₄, and Cl concentrations in lake waters of different zones are tabulated. (Josefson-USGS)
W74-00840

ROTIFERS OF THE NEAR BOTTOM ZONE OF LAKES MIKOŁAJSKIE AND TAITOWISKO,
Institute of Public Utility Services, Warsaw (Poland). Lab. of Hydrobiology.
H. Klimowicz.
Pol Arch Hydrobiol. Vol 19, No 2, p 167-178, 1972. Illus.

Identifiers: *Bottom zones (Lakes), Lakes, *Poland (Lakes Mikolajskie-Taitowsko), *Rotifers.

Evidence is supplied that near the lake bottom the benthic rotifers species are autochthonous, whereas eurytopic and planktonic ones immigrate from other lake zones chiefly from epilimnion. During the warm season the quantitative and qualitative species composition of rotifers over lake bottom is affected mainly by eurytopic and planktonic species. The number of benthic did not considerably change during the study period. The number of species and abundance of individuals in the near-to-bottom zone decreased with increasing depth.—Copyright 1973, Biological Abstracts, Inc.
W74-00935

NEW SPECIES OF FREE-LIVING NEMATODES FROM LAKE BAIKAL, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
S. Ya. Tsaloikhin.
Zool Zh. Vol 51, No 10, p 1559-1563. 1972. Illus. (English summary).
Identifiers: Eudiplogaster-Baicalensis, Lakes, Monochus-Niddensis, *Nematodes, New species, Tobrilius-Fortis, *Tobrilius-Incognitus, *USSR (Lake Baikal).

Tobrilius incognitus differs from the morphologically close species primarily in 5 similar genital papillae and greater separation of the oral capsule from stomal pouches. Tobrilius fortis has very small rudimentary cephalic chaeta, weakly differentiated stoma and thick, massive body. Eudiplogaster baicalensis has very short cephalic chaeta, extensive stoma with 12-14 ridges armed with 2 large dorsal and 1 small ventral teeth. The diagnosis of Monochus niddensis Skwarra, 1922 is broadened.—Copyright 1973, Biological Abstracts, Inc.
W74-00976

STUDY OF ALGAE USED AS FOODS IN THE VALLEY OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City.
M. M. Ortega.
Rev Latinoam. Microbiol. Vol 14, No 2, p 85-97. 1972. Illus.

Identifiers: *Algae, Amomoxyle, Chroococcus-Turgidus, Geology, History, *Mexico, Nostoc-Commune, Phormidium-Tenuis, Pleistocene, *Tecuilitl, Valleys, Human food supplements.

The historical antecedents of the 'tecuilitl' or 'cocolin' and 'amomoxyle' which constituted a human food supplement when the peoples of Anahuac flourished are reviewed. The evolution of the Great Lake of the Valley of Mexico from the Pleistocene to the present day is described in parallel with the use of these products, including toponymia to which 'tecuilitl' gave its origin because of its economic importance. The results of studies in markets and present-day lakes of the Valley of Mexico are presented, as well as the present-day preparation of 'tecuilitl.' Finally the principal components of these products are described: Phormidium tenuis, Chroococcus tur-

WATER CYCLE—Field 02

Water in Plants—Group 2I

gidus and Nostoc commune.--Copyright 1973, Biological Abstracts, Inc.
W74-00982

BETA RADIOACTIVITY OF PERIPHYTON IN CERTAIN DAM RESERVOIRS,
Instytut Gospodarki Komunalnej, Chorzow (Poland). Zaklad Radiol. GOP.
For primary bibliographic entry see Field 05B.
W74-00993

DISTRIBUTION OF MONODACNA COLORATA (EULAMELLIBRANCHIATA, CARDIIDAE) IN THE SAMARSKY BAY OF THE ZAPOROZH-SKY WATER RESERVOIR (IN RUSSIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Institut Gidrobiologii.
Yu. K. Gaishash, and I. P. Lubyanov.
Zool Zh, Vol 51, No 9, p 1402-1404, 1972, English summary.
Identifiers: Bays, *Cardiidae (Distribution), Eulamellibranchiata, *Monodacna-colorata, Reservoirs, Samarsky Bay (USSR), *Zaporozhsky Reservoir (USSR).

After the introduction of Monodacna, its development proceeded very slowly for almost 10 yr. A rather wide distribution of Monodacna in the Samarsky Bay of the Zaporozhsky Water Reservoir (USSR) was determined by a recently arisen favorable hydrochemical regime, optimal depths with oozed grounds, and abundance of food, detritus and phytoplankton. In 1971 the numbers of adult specimens amounted to 120/m² with the biomass of 782 g/m² off the right bay coast and somewhat less off the left coast. In the bay Monodacna occurs within the mass of Dreissena (22,460-31,920 specimens/m²); together they serve as a habitat for amphipods. Monodacna rapidly became an important component of the ration of commercial fishes-benthophages and its mass development will, undoubtedly, contribute to an increase of fish productivity of the water body.--Copyright 1973, Biological Abstracts, Inc.
W74-00999

THE EFFECT OF NUTRIENTS ON THE GROWTH OF BACTERIAL POPULATION IN WATER,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W74-01001

STUDIES OF BIOLOGICAL ENERGY BALANCE AND BIOLOGICAL PRODUCTIVITY IN THE USSR LAKES (IN RUSSIAN),
G. G. Vinberg.
Ekologiya, Vol 3, No 4, p 5-18, 1972, Illus.
Identifiers: *Bacterial growth, Biological studies, Energy balance, Lakes, *Primary productivity, *USSR.

A survey of hydrobiological studies that are concerned with the biological energy balance and biological productivity in USSR lakes is given. The primary productivity of water resources is listed, as well as formulas used in calculations of bacterial growth and the intensity of volumetric changes.--Copyright 1973, Biological Abstracts, Inc.
W74-01009

ECOLOGICAL STUDY OF THE CYANOPHYTES AND CHLOROPHYTES IN SOME PONDS AROUND BRUGES: DETERMINATION OF THE DEGREE OF TROPHISM IN ACCORDANCE WITH SCHROEVER'S PD QUOTIENT, (IN GERMAN),
Ghent Rijksuniversiteit (Belgium).
For primary bibliographic entry see Field 05C.
W74-01012

ECOLOGICAL DATA OF MIRE VEGETATION, (IN RUSSIAN),
Akademija Nauk SSSR, Petrozavodsk. Inst. of Biology.
N. A. Belousova.

Ekologiya. Vol 3, No 4, p: 90-93, 1972, Illus.
Identifiers: Climates, *Ecological data, Geomorphology, *Mire vegetation, Nutrients, *Trophic stages, Vegetation, Acidity.

An ecological study of the mire vegetation was conducted during June-Aug. 1968-1970. The area contains 20-60% mire which results in a high climatic coefficient and geomorphological features. The water is hard (0.28-0.48 mg-ekv) and of low mineral content (less than 50 mg/l). This accounts for a low nutritional value of the mire, and thus a large number of mires are in the mesotrophic or oligotrophic stage of development. An increase in substrate acidity causes a corresponding decrease in a quantity of plant species and vice versa.--Copyright 1973, Biological Abstracts, Inc.
W74-01014

SEDGE ASSOCIATIONS FROM THE OZUNCA SWAMP, (IN RUMANIAN),
Brasov Univ. (Rumania).

M. Danciu.
Stud Cercet Biol Ser Bot. Vol 24, No 2, p: 83-94, 1972, Illus.
Identifiers: Acidity, Minerals, Peaty soils, *Romania (Ozunca swamp), *Sedge associations, Soils, *Swamps, *Caricetum species.

Sedge associations (3) from a peat containing marsh supplied with mineral water from the Barolt mountains, Romania, are analyzed. The Caricetum diandrae Jon. 1932, found only in a small area (0.25 ha) on peaty soil of pH 6.4, is marked by the lack of many species characteristic of the order and association. The Caricetum caespitosae Klika et Smarda 1941 is located on the edge of the moor. Caricetum rostratae Ruebel is represented in 2 phytocenoses on large deposits of acid peat (pH 6.3).--Copyright 1973, Biological Abstracts, Inc.
W74-01016

SOME PHYTOPLANKTON CHARACTERISTICS IN COOLER BASINS, (IN RUSSIAN),
Akademija Nauk SSSR, Moscow. Institut Geografi.
For primary bibliographic entry see Field 05C.
W74-01017

EFFECT OF FISH ON THE BOTTOM OF RESERVOIRS,

Y. Eren, A. Yashouv, and Y. Langer.
Bamidgeh. Vol 24, No 2, p: 40-48, 1972, Illus.
Identifiers: Bottom sediments, Fish, *Israel, *Oscillatoria-Chalybea, *Reservoirs, Salmon, *Tilapia-Aurea, *Cyanophyta.

Tilapia aurea affected the composition of bottom sediments in the experimental pond. In sections with fish the sediments contained 35% less organic matter. It is suggested that both feeding habits and the mechanical activity of the fish caused this change. Presence of fish affected the composition of benthic algae. More filamentous blue-green algae developed in sections without fish. The fish caused a significant decrease in the amount of submerged vegetation. There was no significant difference in the quantity and composition of bottom animals or in the amount of benthic algae between the treated and control areas. The results from the experimental pond verify the theory that the fish in the Tsalmon and Beth Netufa (Israel) reservoirs are involved in the reduction of taste and odor caused by the blue-green alga Oscillatoria chalybea.--Copyright 1973, Biological Abstracts, Inc.
W74-01020

REMARKS ON THE STOCKING OF THE DAM RESERVOIR AT PRZECZYCE WITH LAKE TROUT SALMO TRUTTA M LACISTRIS L.,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.

For primary bibliographic entry see Field 08I.
W74-01072

BOTTOM FAUNA OF DEAD VISTULA,
Warsaw Univ. (Poland). Zoological Inst.
For primary bibliographic entry see Field 05C.
W74-01073

INTRODUCTION TO STUDY 'IN SITU' OF PLANKTON ECOLOGY IN LAKE GENEVA, (IN FRENCH),
O. Gonet.

Bull Soc Vaudoise Sci Nat. Vol 71, No 5, p 245-268, 1972. Illus. (English summary).
Identifiers: Conductivity, Ecology, Lakes, *Nitrogen, *Phosphorus, *Phytoplankton, *Switzerland (Lake Geneva), Temperature, Transparency.

Research concerning the relationship between water characteristics (N and P contents, conductivity, temperature, Secchi disc readings) and phytoplankton in the lake Leman (L. Geneva, Switzerland) is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-01079

ALGAE FEEDING OF YOUNG OF CERTAIN FISH SPECIES OF THE KAIRAK-KUMSKII RESERVOIR, (IN RUSSIAN),
Akademija Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 08I.
W74-01082

2I. Water in Plants

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 10 GENERA OF FRESHWATER NEMATODES (NEMATODA) OF EASTERN NORTH AMERICA,
Purdue Univ., Lafayette, Ind. Dept. of Entomology.

V. R. Ferris, J. M. Ferris, and J. P. Tjepkema.
Copy available from GPO Sup Doc as EPI-16: 18050 ELD 01/73, \$4.00; microfiche from NTIS as PB-224 830, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1973. 38 p, 14 fig, 17 ref. EPA Project 18050 ELD 01/73. 14-12-894.

Descriptors: *Aquatic fauna, *Nematodes, Preservation, *Biota, Data collections, *North America. Identifiers: *Identification manual, Illustrated key.

An illustrated key to 56 genera of freshwater nematodes of eastern North America is given. Notes are included on the significance of nematodes in freshwater ecosystems, collecting and isolating nematodes, slide preparation and counting, and identification and use of the key. (See also W73-13736 thru W73-13744, and W74-00564) (EPA)
W74-00563

NEMATODA, ACANTHOCEPHALA AND HIRUDINEA IN FISHES FROM THE RIVER HRON (CZECHOSLOVAKIA), (IN CZECH),
Slovenska Akademie Vied, Kosice (Czechoslovakia). Helmintologicky Ustav.

R. Zitnan.
Stud Helmintol, 2, p 21-32, 1968, Illus. English summary.
Identifiers: *Acanthocephala, Cottus-gobio, Cottus-poecilopus, *Czechoslovakia (River Hron), Fishes, *Hirudinea, Metabronema-truttae, *Ne-

Field 02—WATER CYCLE

Group 21—Water in Plants

matoda, *Neoechinorhynchus-rutili*, Pike, *Piscicola-geometra*, *Pomphorhynchus-laevis*, *Pseudoechinorhynchus-clavula*, *Raphioascaris-acus*, Rivers, Salmonidae.

Fishes (851) belonging to 47 species were examined. Of these fishes 115 (13.51%) were infested with nematodes, 290 (34.07%) with acanthocephala and 13 (1.52%) with hirudinea. From the epizootiological point of view *Raphidacarus acicus* and *Metabronema truttae* are of particular importance being dangerous mainly for pikes and salmonidae. Particular attention should be given to the acanthocephala which have a characteristic ability to parasitize in a wide range of hosts and which belong to the most pathogenous fish helminths. *Pomphorhynchus laevis* found in 37 fish species coming from 12 localities, *Neoechinorhynchus rutili* found in 14 fish species from 3 localities and *Pseudoechinorhynchus clavula* found in 7 fish species from 6 localities present the widest ecological variance. At the upper flow of the river Hron P. *clavula* appears to be important in the salmonidae; it is carried and distributed mainly by *Cottus gobio* and *C. poecilopus* both of which are an essential food element of larger trouts. Of the 2 hirudinea found *Piscicola geometra* is the most important and the most widely distributed. The majority of both economically important and unimportant fishes of the river Hron present helminth hosts of epizootiological importance even for fishes bred on fish farms of the Hron river basin.—Copyright 1973, Biological Abstracts, Inc. W74-00679

PRESSURE BOMB MEASURES CHANGES IN MOISTURE STRESS OF BIRCHLEAF MOUNTAINMAHOGANY AFTER PARTIAL CROWN REMOVAL,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. C. J. Campbell, and C. P. Pase. USDA Forest Service Research Note RM-221, 1972. 4 p, 3 fig, 8 ref.

Descriptors: *Moisture stress, *Chaparral, Vegetation, *Arizona, Southwest U.S., *Watershed management, Demonstration watersheds, *Birch trees.
Identifiers: *Pressure bomb measurement, Mountainmahogany (*Cercocarpus betuloides*), Crown reduction, Leaf mass, *Vegetation management, Canopy leaves.

Leaf mass of mountainmahogany (*Cercocarpus betuloides*) was reduced 22, 36, 41, and 66 percent. Forty-one percent or more leaf-mass removal caused highly significant reductions in plant moisture stress but no significant reductions in stress occurred when leaf-mass removal was 36 percent or less. (Forest Service)
W74-00681

CESTOIDEA OF FISH IN THE RIVER HRON (CZECHOSLOVAKIA), (IN CZECH),
Slovenska Akademie Vied, Kosice (Czechoslovakia). Helmintologicky Ustav. R. Zitnan.

Stud Helminton, 2, p 11-20, 1968, Illus, English summary.

Identifiers: *Biacetabulum-appendiculatum*, *Caryophylaeus-brachycollis*, *Cestoidea, *Czechoslovakia (River Hron), *Epizootiology, Fish, *Proteocephalus*, Rivers.

Fishes (851) belonging to 47 species were examined and 16 Cestoidea species were found. *Biacetabulum appendiculatum*, *Caryophylaeus brachycollis* and *Proteocephalus* sp. are species which were not previously described from Czechoslovakia. The hosts, location, distribution and worm burden are reported and descriptions and drawings of lesser known species given. The epizootiological significance of the more important species is indicated.—Copyright 1973, Biological Abstracts, Inc.

W74-00689

POPULATION DYNAMICS OF HERBACEOUS COMMUNITIES OF PILANI (RAJASTHAN),
S. S. Coll., Alipur (India). Dept. of Botany. V. R. Babu.

Jap J Ecol. Vol 21, No 3/4, p 87-95. 1971. Illus. Identifiers: **Borreria-Articularis*, *Cenchrus biflorus*, *Herbaceous communities, *India (Rajasthan), Population (Plants), Sandy, Soils, Weeds, Hydrogen ion concentration.

Population dynamic of herbaceous communities of certain areas around Pilani (India) were studied during the 1 growth season (monsoon) of 1968. The analysis of habitat factors and interrelationships between the habitat factors and the *Borreria articulata* population were also studied. Among about 10 herbaceous associates in various localities, *B. articulata* and *Cenchrus biflorus* are closely associated. An increase in the associates of the grass group reduced the *B. articulata* populations. In cultivated fields, the ratio between weeds and the crop plants is found to be 7:1. Of the 7 weeds for every crop plant, 3 are *B. articulata*. The population of *B. articulata* is limited by the fine sand content. The plants' preference for sandy soils with pH near neutral is established. Populations showed negative logarithmic relationship with soil pH from 7.3 to 7.7.—Copyright 1973, Biological Abstracts, Inc.
W74-00714

W74-00736

JOJOBA AND ITS USES, AN INTERNATIONAL CONFERENCE, JUNE 1972.
For primary bibliographic entry see Field 03F. W74-00756

REPTILES OF THE CHESAPEAKE BAY REGION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L. W74-00918

WATERFOWL OF THE CHESAPEAKE BAY,
Bureau of Sport Fisheries and Wildlife, Jamestown, N. Dak. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 02L. W74-00919

EFFECTS OF WATER AND HEAT ON SEEDLING EMERGENCE,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 03F. W74-00930

RARE AND NEW SPECIES OF ROTIFERS IN THE FAUNA OF POLAND,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology. M. Lewkowicz.
Acta Hydrobiol. Vol 14, No 2, p 143-148, 1972. Illus. Identifiers: *Fauna, *Lecane-Bifurca*, *Lepadella-Numphia*, *Poland, Records, *Rotifers, Species, *Trichocerca-Jenningsi*, *Volga-Spinifera*.

Planktonic and littoral Rotatoria (25 spp.) which are rare or new for the fauna of Poland were identified. These species were found in the fishponds belonging to the Laboratory of Water Biology of the Polish Academy of Sciences at Golysz. The following species are new for the fauna of Poland: *Volga spinifera* Skorikov 1903, *Lepadella nympha* Donner 1943, *Lecane bifurca* (Bryce) 1892, *Trichocerca jenningsi* Voigt 1957.—Copyright 1973, Biological Abstracts, Inc. W74-00970

THE RESPONSES TO CURRENT FLOW OF TWO STREAM DWELLING TRICLADS, CRENOBIA ALPINA (DANA) AND POLYCELIS FELINA (DALYELL),
Waterloo Univ. (Ontario). Dept. of Biology. M. A. Lock.
Oecologia (Berl). Vol 10, No 4, p 313-320. 1972. Illus. Identifiers: Apparatus, **Crenobia-Alpina*, Flow, **Polycelis-Felina*, Stream, *Triclad.

An apparatus is described which allows triclad to choose between the fast and slow regions of a stirred tank. In the absence of a stone substratum *C. alpina* preferred or tolerated higher current speeds than *P. felina*, this effect was enhanced when a stone substratum was added to the apparatus. These results indicate that the absence of *P. felina* from the steep gradient regions of streams could be accounted for by its preference for slower micro-currents. Conversely the presence of *C. alpina* in steep gradient regions could be accounted for by its preference for or tolerance to higher micro-currents.—Copyright 1973, Biological Abstracts, Inc. W74-00971

MALEZAS ACUATICAS, AQUATIC WEEDS, J. M. BRISTOW,
Colombian Agricultural Inst., Bogota.
For primary bibliographic entry see Field 04A.

LIST OF THE GASTROPODS OF THE ST. LAWRENCE RIVER IN THE REGION OF GENTILLY, (IN FRENCH),
Queen's Univ., Kingston (Ontario).

WATER CYCLE—Field 02

Water in Plants—Group 21

G. Vaillancourt, and M. Dingemann.
Sterkiana. 48, p 17-29. 1972. Illus. (English summary).
Identifiers: *Canada, *Gastropods, Rivers, *St. Lawrence River.

A list of 23 spp. from 7 families is prepared from quantitative field surveys made 1970-72 at 7 stations. Tables give the counts/m² for each month.—Copyright 1973, Biological Abstracts, Inc.
W74-00973

KINONCHULUS SATTLERİ N.G.N.SP. (ENOPLIDA, TRIPYLOIDEA), AN ABERRANT FREELIVING NEMATODE FROM THE LOWER AMAZONAS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
F. Riemann.
Veroeff Inst Meeresforsch Bremerhaven. Vol 13, No 2, p 317-326. 1972. Illus.
Identifiers: *Amazonas, *Brazil, Enoplida, Genus, Kinonchulus-Sattleri, *Nematode, New species, Tripyloidea.

Kinonchulus, a member of the primitive Enoplida family Onchulidae, has a remarkable protrusive pharynx outfitted with long pricks and rows of hooks. It shows a striking resemblance to the head of kinorhynchs or nematomorph larvae. Relationships to Tripylidiae and Diphtherophoroidea are assumed.—Copyright 1973, Biological Abstracts, Inc.
W74-00974

GREEFFIELLA MOPPA SP. N. FROM THE SKAGERRAK (NEMATODA, DESMOSCOLECIDAE), (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
M. Schrage.
Veroeff Inst Meeresforsch Bremerhaven. Vol 13, No 2, p 327-337. 1972. Illus. (English summary).
Identifiers: *Desmoscolecidae, Greeffella-Beatriei, Greeffella-Dasyura, *Greeffella-Moppa, Greeffella-Oxycaudata, *Nematoda, New species, Skagerrak, Species, Synonymy.

This new species was collected at depths from 220-310 m. It is characterized by subventral setae in the male. There is evidence that preanal and postanal subventral copulatory organs of other Greeffella species derived from such subventral setae. The synonymy of *G. oxycaudata* (Greeff 1869) is discussed; specimens mentioned under this name by Gerlach are transferred to *G. beatlei* Lorenzen 1969 and *G. dasyura* Cobb 1922.—Copyright 1973, Biological Abstracts, Inc.
W74-00975

NEW SPECIES OF FREE-LIVING NEMATODES FROM LAKE BAIKAL, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 02H.
W74-00976

NEMATODES IN DAMS OF ZEMPLINSKA SIRAVA, (IN CZECH.),
A. Saly.
Zb Slov Nar Muz Prir Vedy. Vol 16, No 2, p 19-25. 1970.
Identifiers: *Aphelenchoides-Parietinus*, *Czechoslovakia (Zemplinska Sirava), Dams, *Nematodes, New species, *Panagrobelus-Coronatus, Records, *Rhabditis-Brevispina*, Fodder beams, Fodder grasses.

Soil samples from grass root soil and from roots of other plants (fodder beans) growing on slopes of dams contained 29 spp. of soil nematodes belonging to 19 genera and 9 families. The species *Panagrobelus coronatus* was new for Czechoslovakia. On 13 different fodder grasses and plants the density of nematodes fluctuated

from 30-625 specimens/100 g soil with *Aphelenchoides parietinus* and *Rhabditis brevispina* the most numerous species.—Copyright 1973, Biological Abstracts, Inc.
W74-00977

MOISTURE BALANCE IN THE OAK FORESTS ON THE NORTHERN DONETS RIGHT BANK, (IN RUSSIAN),
For primary bibliographic entry see Field 04A.
W74-00983

NATURAL FACTORS OF ACTIVATION OF PLAGUE EPIZOOTIAE IN SIBERIA, (IN RUSSIAN),
G. S. O. Letov.
Zool Zh. Vol 51, No 7, p 1041-1047. 1972. Illus. (English summary).
Identifiers: *Epizootiae, Parasites, *Plague, *Sousliks, USSR (Siberia-Mongolia).

The zone of plague natural foci in Mongolia and South Siberia is located mainly in regions which did not suffer from Pleistocene glaciation. The formation of plague biocoenosis proceeded under the effect of sharply continental dry climate. During the dry spring season the course of Plague epizootiae among long-tailed Siberian and Daurian sousliks is not intensive. A sharp increase in the development of epizootiae coincides with the appearance of young animals going out of burrow during the season of maximal precipitation and resumption of plant vegetation. The optimum of life conditions for rodents and ectoparasites is prerequisite for activation of epizootiae.—Copyright 1973, Biological Abstracts, Inc.
W74-00990

CALLUS TISSUE CULTURE FROM THE VIEW-POINT OF WATER RELATIONSHIPS (IN GERMAN),
Komenskeho Universita, Bratislava (Czechoslovakia).
S. Klenovska.
Acta Fac Rerum Nat Univ Comenianae Physiol Plant, 5, p 101-105. 1972, Illus, English summary.

Identifiers: *Callus tissue cultures, *Nicotiana tabacum, Evaporation, Water potential.

Outer callus tissue in *Nicotiana tabacum* cv. 'Samsun' cultures had a lower water potential than inner tissue, due to evaporation.—Copyright 1973, Biological Abstracts, Inc.
W74-00995

EFFECT OF RETARDANT CHLOROCHOLINE CHLORIDE ON CONTENT OF PROTEIN COMPONENTS IN PLANT LEAVES DURING DROUGHT (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
For primary bibliographic entry see Field 03F.
W74-00996

SOME ECOLOGICAL DATA ON FRESH-WATER OSTRACODS OF THE TEMPORARY AND PERMANENT WATERS IN THE VICINITY OF BUCHAREST (IN RUMANIAN),
Academie R. S. R., Bucharest. Institutul de Biologie.
F.-E. Caraion.
Stud Cercet Biol Ser Zool, Vol 24, No 3, p 237-241. 1972, Illus, English summary.
Identifiers: Cypris-pubera, Ecological data, Eu-cypis-lutaria, Eucypris-virens, Heterocypris-incongruens, *Ostracods, *Romania (Bucharest), *Cypriidae.

Data concerning the species of freshwater Ostracoda (Cypriidae) which usually populate the temporary and permanent water situated on the territory of Bucharest, Romania as well as in its

peripheric area, are presented. The dominance of certain species such as *Cypris pubera*, *Eucypris virens*, *Eucypris lutaria* and *Heterocypris incongruens* in the spring swamps and ditches is shown.—Copyright 1973, Biological Abstracts, Inc.
W74-01000

EFFECT ON FLOOD INTRODUCED PLANTS IN THE DESNA RIVER FLOOD PLAIN NEAR OS-TRA, (IN UKRAINIAN),
For primary bibliographic entry see Field 04A.
W74-01013

PRIMARY PRODUCTION-PHYTOPLANKTON RELATIONSHIP IN THE CRAPINA-JIJILA COMPLEX IN THE FLOOD CONDITIONS OF 1970, (IN RUMANIAN),
Bucharest Univ. (Romania). Faculty of Biology.
L. Gavrilă, I. Chiosila, and A. Schneider.
Stud Cercet Biol Ser Bot. Vol 24, No 2, p: 141-157, 1972, Illus.
Identifiers: Basins, Floods, *Phytoplankton relationships, Pisciculture, Plankton, *Primary production, *Romania (Crapina-Jijila complex), Zooplankton.

Under the flood conditions of 1970, primary production was provided primarily by phytoplankton. This attests to the very advantageous nature of this primary production which joined the trophic flow of the basin at the very moment of its formation. It was immediately taken over by the secondary factors of the trophic chain. The piscicultural arrangement of the Jijila basin (Romania) has a positive influence on the development of the phytoplankton and, unlike the previous years when this basin was not protected against flood, results in an adequate primary plankton production. In determining the characteristic of the primary production, the phytoplankton-macrophytes-zooplankton relationship plays a very important role. The value of the primary plankton production is dependent upon the physiological condition of the photosynthesizing organisms and on the trophic group to which these belong.—Copyright 1973, Biological Abstracts, Inc.
W74-01015

SEDGE ASSOCIATIONS FROM THE OZUNCA SWAMP, (IN RUMANIAN),
Brasov Univ. (Romania).
For primary bibliographic entry see Field 02H.
W74-01016

PLANTATIONS OF CONIFEROUS TREE SPECIES, (IN RUSSIAN),
M. V. Strukov.
Sb Rab Po Lenz Khoz Mold Lenz Optyna Stn. 4 p 146-147. 1970.
Identifiers: *Coniferous trees, Oak, *Pinus-Nigra, Pinus-Nigra-Caramanica, Pinus-Sylvestris, Spruce, *Tree species, *USSR (Moldavia).

Investigations of 37-yr-old plantations in the Gerbovetski Forest, USSR showed that pine and spruce can grow successfully in the southern steppe zone of Moldavia. The drought resistant *Pinus nigra* is more suitable to dry conditions, than *P. sylvestris* and spruce. *P. nigra caramanica* is similar to *P. nigra* in its biological characteristics. The productivity of coniferous tree species is 1.5 (site class) higher than that of oak under the same conditions. In establishing pine and oak plantations adequate spacing is important, dense planting may lead to the death of the stands.—Copyright 1973, Biological Abstracts, Inc.
W74-01023

EVALUATION OF A REMOVAL METHOD FOR ESTIMATING THE NUMBERS OF ROCK POOL CORIXIDS (HEMIPTERA, CORIXIDAE),
Helsinki Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 07B.

Field 02—WATER CYCLE

Group 21—Water in Plants

W74-01055

THE VARIATION OF WATER RELATIONS AND RESPIRATION INTENSITY IN MALE AND FEMALE EPHEDRA DISTACHYIA PLANTS OF THE BLACK SEA COAST AS A FUNCTION OF AGE,

Alexandru Ion Cuza Univ., Iasi (Rumania).
E. Jeanrenaud.
Rev Roum Biol Ser Bot. Vol 17, No 1, p 29-41, 1972. Illus.
Identifiers: Age, *Black Sea, Coasts, *Ephedra-Distachya, *Phenophase, *Respiration, Sea water.

Water relations in male and female *E. distachya* plants growing in the same biotope (dunes of the littoral) differed in the various phenophases. A direct correlation between the diurnal course of the intensity of respiration and of transpiration was found to exist in the females and males. The value of the intensity of respiration in male and female plants varied with the function that they accomplish in certain phenophases. In experimentally produced progressive dehydration of the tissues, the intensity of respiration varied both as a function of the phenophase and sex.—Copyright 1973, Biological Abstracts, Inc.
W74-01076

THE INFLUENCE OF METEOROLOGICAL ELEMENTS ON THE ANNUAL RHYTHM OF HEIGHT GROWTH IN PINES, (IN GERMAN),

Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Eberswalde (East Germany). Institut fuer Forstwissenschaften. R. Luetzke.
Flora (Jena). Vol 116, No 4, p 451-462, 1972. Illus. (English Summary).

Identifiers: *Annual, Growth, Height, *Meteorological conditions, Moisture, *Pines, Soils, Solar radiation, Temperature, Winds, Sands.

The measurements were performed in a pole wood on a sandy soil with deep groundwater. The deviations from the average trend of the annual height growth course were caused almost entirely by temperature. When the influence of temperature was eliminated, a relation between increment and global radiation, precipitation, soil-moisture, air humidity, potential evaporation and wind was not to be ascertained. There was a high coefficient of determination for the non-linear regression of time parameter and temperature upon current increment. The reasons for the strong influence of temperature on current height growth and for the lack of influence of the moisture parameters are discussed.—Copyright 1973, Biological Abstracts, Inc.
W74-01077

ON THE STELLARIO-ALNETUM GLUTINOSAE (MIKYSKA 1944) LOHMEYER 1957 IN THE CZECH SOCIALISTIC REPUBLIC (CSR),

Ceskoslovenska Akademie Ved, Prague. Biologicky Ustav. Z. Neuhausova-Novotna.

Folia Geobot Phytotax. Vol 7, No 3, p 269-284, 1972. Illus. (English summary).
Identifiers: *Alder, Alnetum-Glutinosae, *Ash, *Czechoslovakia, *Gley, Lamium-Maculatum, Pulmonaria-obscura, Soils, *Stellaria-holostea*, *Stellaria-nemorum*, Water table.

This community is a typical *Alnion glutinoso-in-canace*-forest in brook valleys of the colline and lower submontane situations. *Stellario-Alnetum* is characterized by the dominance of alder and ash in the tree layer and by the occurrence of the (hydro) mesophilous differential species of the association, *Stellaria nemorum*, *S. holostea*, *Pulmonaria obscura* and *Lamium maculatum* in the herb layer. This community represents, from the ecological point of view, a periodically or episodi-

cally flooded alluvial forest on gley soils. According to the soil moisture and air regime 4 subassociations can be distinguished: *Stellario-Alnetum crepidetosum paludosae* with often wet to swampy soils, high groundwater table (typical Gley) and unfavorable air regime of the soils. *S-A. chrysosplenietosum* on moisture to wet, but not swampy soils with high groundwater table (typical Gley) and well aerated soils, *S-A. aliectosum ursini* with fresh soils in the dry period with a high or low groundwater table (typical Gley, Braunerde-Gley) and the well aerated soils and the relatively dry *S-A. typicum* with mostly low groundwater table (Braunerde-Gley) and very well aerated soils. The relations of *Stellario-Alnetum* to the allied Central-European alluvial communities as well as the geographical distribution of this association in Central-Europe are briefly discussed.—Copyright 1973, Biological Abstracts, Inc.
W74-01078

DEEPSOIL STUDIES OF OAK ROOT SYSTEMS IN OLD AGE PLANTATIONS, (IN RUSSIAN),

Yu. P. Kravchuk.
Sb Rab Po Lesn Khoz Mold Lesn Opytn Stn. 4, p 129-145, 1970.

Identifiers: *Oak root systems, Old plantations, Roots, *Soils, *USSR (Gervoetskii forest), Soil-water-plant relationships.

Digging out in the Gervoetskii Forest of root systems (RS) of oak 52 and 56 yr old to the full depth of their penetration into the ground (8 m) showed the presence of both surface roots (SR) and deep roots (DR). In the upper soil horizons there is a dense net of large and fine roots while in the deeper layers, there are slightly branching, threadlike, tap and vertical roots. The oak RS envelope a considerable volume of soil (165-200 m³) which improves moisture and nutrient uptake. In tree species with a tap RS, one should distinguish SR zones and DR zones. A major role in forest productivity is played by the upper part of the RS in humus horizons and the role of DR increases in importance during years with low moisture, by raising the resistance of oak to drought. One should not establish pure and excessively dense stands and the optimum structure of stands is: an upper story of oak, with a moderate number of stems, and a second story of shade-tolerant tree species.—Copyright 1973, Biological Abstracts, Inc.
W74-01085

AGE AND GROWTH OF THE CHUB LEUCISCUS CEPHALUS (L.) IN THE OURTHE RIVER AND BERWINE CREEK, (IN FRENCH),

Liege Univ. (Belgium). Aquarium Lab. J-C. Philippiart.

Ann Soc R Zool Belg. Vol 102, No 1/2 p 47-81, 1972, Illus. (English summary).

Identifiers: Age, *Belgium (Ourthe River), *Chub, Growth, Leuciscus-Cephalus, Rivers.

Results are presented of a study of the age and growth of *L. cephalus* (L.) in the Ourthe river and in the Berwine stream. Preliminary contributions to the study of the biology, the dynamics and the production of the fish community in 2 coarse fish tributaries of the Meuse river, Belgium are also given.—Copyright 1973, Biological Abstracts, Inc.
W74-01097

EFFECT OF DEPTH OF SOIL CULTIVATION AND OF FERTILIZERS ON THE SURVIVAL AND GROWTH OF PINE ON THE LOWER DNEIPER SANDS, (IN RUSSIAN),

For primary bibliographic entry see Field 04A.
W74-01098

2J. Erosion and Sedimentation

ACCUMULATION OF SEDIMENT IN THREE MISSISSIPPI RESERVOIRS,

Mississippi State Univ., State College. Water Resources Research Inst.

C. M. Hoskin.

Available from the National Technical Information Service as PB-224 838, \$2.75 in paper copy, \$1.45 in microfiche. Completion Report, July 1973, 15 p, 3 fig, 1 tab, 16 ref. OWRR A-061-MISS (1).

Descriptors: *Multiple-purpose reservoirs, *Sedimentation rates, *Mississippi, *Lake sediments, Cores.

Identifiers: *Phleger gravity cores, USM Lake (Miss), Lake Geiger (Miss), Lower Ross Barnett Reservoir (Miss).

Phleger gravity cores were collected from three small reservoirs in Mississippi - USM Lake (7 cores), Lake Geiger (12 cores) and Lower Ross Barnett Reservoir (11 cores). Striking contrasts in color and grainsize permitted differentiation of reservoir sediment (dark green, nearly sand-free) from older and now-inundated soil (red, yellow, brown or grey muddy sand) in these cores. Range and average thickness of reservoir-accumulated sediment for 12-year-old USM Lake, 30-year-old Lake Geiger, and 11-year-old Ross Barnett Reservoir were, respectively, 55 to 342 mm, X 137 mm; 35 to 210 mm, X 93 mm; and 5 to 347 mm, X 58 mm. Average annual rate of sediment accumulation USM Lake, Lake Geiger, and Lower Ross Barnett Reservoir was calculated to be, respectively, 9 mm/year, 3 mm/year, and 2.6 mm/year. Contrary to expectations, no sedimentary layering was discernible in split cores of these reservoir sediments.
W74-00561

DISTRIBUTION OF TRACE METALS IN THE PORE WATERS OF SHALLOW WATER MARINE SEDIMENTS,

Edinburgh Univ. (Scotland). Grant Inst. of Geology.

For primary bibliographic entry see Field 02K.

W74-00828

CURRENT STATUS OF THE KNOWLEDGE OF THE BIOLOGICAL EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS IN CHESAPEAKE BAY,

Maryland Univ., Prince Frederick. Hallowing Point Field Station.

For primary bibliographic entry see Field 02L.

W74-00920

INTERACTION OF NITRILOTRIACETIC ACID WITH SUSPENDED AND BOTTOM MATERIAL.

National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.

For primary bibliographic entry see Field 05A.

W74-00926

2K. Chemical Processes

THE NATIONAL QUALITY OF GROUND WATER IN MINNESOTA,

Geological Survey, St. Paul, Minn.

For primary bibliographic entry see Field 02F.

W74-00567

PROPAGATION OF SINUSOIDAL SOLUTE DENSITY OSCILLATIONS IN THE MOBILE AND STAGNANT PHASES OF A SOIL,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 02G.

W74-00604

WATER CYCLE—Field 02

Chemical Processes—Group 2K

RATE AND MECHANISM OF NA-MONTMORILLONITE HYDROLYSIS IN SUSPENSIONS, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.

I. Shainberg.
Soil Science Society of America Proceedings, Vol 37, No 5, p 689-694, September-October 1973. 2 fig, 2 tab, 9 ref.

Descriptors: *Hydrolysis, *Montmorillonite, *Ion exchange, Hydrogen ion concentration, Sodium, Electrical conductance, Conductivity, Water chemistry.

The electrical conductivities of Na-montmorillonite suspensions were studied at various NaCl concentrations and two temperatures as a function of time. The conductivities of the suspensions increased with time, indicating that the suspensions were not stable. The rate of spontaneous decomposition increased with the clay concentration in the suspension and with the temperature. When the electrical conductivities were plotted against the square root of time, a straight line was obtained. These findings suggest that the mechanism of the reaction consists of two elementary consecutive reactions: the first is a rapid exchange reaction between adsorbed Na and H ions in solution and the second reaction is a first-order transformation of H-clay to Al-clay. (Knapp-USGS) W74-00606

DISSOLVED ALUMINUM IN ACID SULFATE SOILS AND ACID MINE WATERS, Agricultural Univ., Wageningen (Netherlands). Dept. of Soil and Science and Geology. For primary bibliographic entry see Field 05B. W74-00607

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: I. THEORY, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics. For primary bibliographic entry see Field 02G. W74-00611

ALTERNATING CURRENT POLAROGRAPHY IN THE HARMONIC MULTIPLEX MODE. OBSERVATIONS ON THE USE OF DIGITAL SIGNAL CONDITIONING WITH THE FAST FOURIER TRANSFORM ALGORITHM, Northwestern Univ., Evanston, Ill. Dept. of Chemistry. For primary bibliographic entry see Field 07C. W74-00631

POLAROGRAPHIC STUDY OF CALOMEL ELECTRODE IN ANHYDROUS FORMIC ACID, Quebec Univ., Rimouski (Quebec). Dept. of Pure Sciences. M. Arnac, and G. Verboom. Analytical Chemistry, Vol 45, No 11, p 1954-1956, September 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Electrochemistry, Organic acids, Solubility, Aqueous solutions, Methodology.
Identifiers: *Formic acid, *Polarography, *Saturn calomel electrodes, *Dropping mercury electrode, Organic solvents, Calomel electrodes, Reference electrodes, Amperometric titration.

The formic acid analog of the saturated calomel electrode has been studied by polarography since the equivalent reference is commonly used in glacial acetic acid. Direct current polarograms of the mercury system were obtained for anhydrous formic acid solutions containing variable amounts of chloride. The working cell was equipped with a condenser unit, cooled by circulating ice water. Controlled current oxidation (10 mA) of a mercury coulometric electrode of large area introduced mercurous ions in the solution. The drop time of

the capillary electrode was in the range of 4-5 seconds. Voltage scanning was 60 mV per minute. Solutions were all initially deaerated with oxygen-free nitrogen for 10 min. The temperature of the water thermostat used throughout this investigation was maintained at 25.0 plus or minus 0.5 C. Measurements were carried out in a nitrogen atmosphere. Polarographic maximums were eliminated by adding gelatin. The formic acid analog of the saturated calomel electrode fulfills the requirements of a reference system. To calculate the solubility product of calomel it should be necessary to know the complexation constant of mercurous ions with formate ions. This constant has not been determined; the electrochemical system studied proceeds irreversibly in a noncomplexing supporting electrolyte medium (potassium perchlorate). The value of pK and the solubility product constant of mercurous chloride in aqueous solution (ps sub aq equals 17.9) are in the same order of magnitude. Nevertheless calomel precipitation is more quantitative in anhydrous formic acid than in water. (Holoman-Battelle) W74-00633

SPINNING DROPPING MERCURY ELECTRODE-A PRACTICAL ANALYTICAL TOOL, Saint John's Univ., Jamaica, N. Y. Dept. of Chemistry. H. J. Morko, and R. E. Cover. Analytical Chemistry, Vol 45, No 11, p 1983-1984, September 1973. 12 ref.

Descriptors: *Monitoring, *Aqueous solutions, *Polarographic analysis, Laboratory equipment, Continuous flow, *Electrodes.
Identifiers: Spinning dropping mercury electrode, Dropping mercury electrode, Limiting currents, Ion selective electrodes.

A spinning dropping mercury electrode (SDME) has been developed for continuous analysis of stirred or flowing systems. The SDME overcomes the difficulty of the vibration dropping mercury electrode (VDME); namely, mechanical complexity and the need for high mercury pressure. The SDME uses straight barometer-tubing capillaries of commercial size which are pointed downward and usable in small diameter streams. The capillary is rotated in a ball-bearing housing around its own axis at 0-7000 rpm. The rotating mercury reservoir is attached to the capillary with Tygon tubing. The results obtained with the SDME were similar to those with the VDME, and their polarograms were essentially identical. Optimal analytical response was obtained at the highest agitation rate. Limiting currents for Cd in KNO₃, the effect of rotation on maxima and limiting currents, and the effect of drop time on adsorption inhibition are discussed. (Little-Battelle) W74-00634

AN AMMONIUM ION-SPECIFIC ELECTRODE, Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry. J. G. Montalvo, Jr. Analytica Chimica Acta, Vol 65, No 1, p 189-197, June 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Ions, *Aqueous solutions, *Air environment, *Permselective membranes, Fabrication, Selectivity, Pollutant identification, Testing procedures, Hydrogen ion concentration, Chemical reactions, Ureas, Optimization, Sodium chloride, *Sodium, *Potassium.
Identifiers: *Ion selective electrodes, Ammonium, *Ammonium electrodes, Sensors, Ammonium chloride, Potassium chloride, Urease.

The complete lack of response of a gas-permeable membrane cationic electrode to potassium and sodium ion (at representative clinical levels) and the response to ammonium ion are illustrated by noting the response when the electrode is dipped into various solutions. An ammonium ion-specific

electrode was prepared by coupling a hydrophobic ammonia-permeable membrane to a Beckman monovalent cation electrode. At physiological pH values the ratio of ammonia to ammonium ion is only 0.01, yet the gas-transport mechanism is still operable; an electrode designed on this principle was able to detect ammonium ion produced via the urea-urease reaction. The electrode can be operated in an air stream or in an aqueous medium. The electrode can also be used in an ultra-sensitive mode by pH stripping of ammonia from the test solution. (Holoman-Battelle) W74-00636

ELECTROCHEMICAL STUDY OF A HETEROGENEOUS COPPER (II)-SELECTIVE ELECTRODE; STUDY OF SELECTIVITY AND POTENTIAL STABILITY, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry. J. Pick, K. Toth, and E. Pungor. Analytica Chimica Acta, Vol 65, No 1, p 240-244, June 1973. 6 fig, 4 ref.

Descriptors: *Selectivity, *Copper, Aqueous solutions, *Heavy metals, Water analysis, Stability, *Ions.

Identifiers: *Ion selective electrodes, *Membrane electrodes, Life time, *Potential stability, Chemical interference, Pretreatment, Electrode potential.

The lifetime of the copper (II)-selective membrane electrode was studied for three conditions: (1) in the first period of pretreatment in a reducing medium; (2) in prolonged use; and (3) on soaking the electrode in 1 M copper (II) sulfate. The results showed that the electrode responds to Cu (II) without pretreatment, but pretreating in reducing medium such as ascorbic acid is necessary to obtain reproducible results. Electrode response decayed only after 3 months. Soaking in copper sulfate reduced lifetime to 3 weeks, but the effect was reversible by treatment in a reducing medium. Selectivity tests were conducted with solutions containing Pb, Cd, Zn, Co, Ni, Mn, Ag, Hg, and Bi ions. The first six ions did not adversely affect electrode response; however, metal cations such as Ag, Hg, and Bi which form less soluble sulfide precipitates than copper sulfide interfered with the electrode function. (Little-Battelle) W74-00637

POLYMER MEMBRANE ELECTRODES. PART I. A CHOLINE ESTER-SELECTIVE ELECTRODE, Corning Glass Works, N. Y. Research and Development Lab., G. Baum, M. Lynn, and F. B. Ward. Analytica Chimica Acta, Vol 65, No 2, p 385-391, July 1973. 2 fig, 4 tab, 9 ref.

Descriptors: Fabrication, *Permselective membranes, Hydrolysis, Biochemistry, Chemical reactions, Electrochemistry, Selectivity, Cations, *Electrodes.

Identifiers: *Ion selective electrodes, *Polymer membrane electrodes, Choline ester electrodes, *Enzyme activity, Performance evaluation, Sensors, Acetylcholinesterase, Acetylcholine, Polyvinyl chloride membranes, Liquid membrane electrodes, Choline, Acetyl-beta-methylcholine, Butyrylcholine.

An electroactive polyvinylchloride membrane can be prepared which has a Nernstain response towards choline and choline esters. The membrane is prepared from a solution of acetylcholine tetraphenylborate in a phthalate ester which serves as the plasticizer for PVC. The membrane electrode can be used for the kinetic assay of acetylcholine esterase activity. A rate equation is derived which describes the response of the electrode towards simultaneous substrate disappearance and product formation during the en-

Field 02—WATER CYCLE

Group 2K—Chemical Processes

zyme-catalyzed hydrolysis of acetylcholine. The performance of the polymer membrane electrode is markedly superior to the liquid-membrane electrode. The polymer membrane electrode has a very short recovery time between assays (1-3 min) and the start-up after an overnight storage is only about 10 min. The results obtained with the polymer membrane electrode exhibit significantly less scatter than the results obtained with the liquid-membrane electrodes. (See also W74-00648) (Holoman-Battelle)
W74-00647

POLYMER MEMBRANE ELECTRODES. PART II. A POTASSIUM ION-SELECTIVE MEMBRANE ELECTRODE,
Corning Glass Works, N. Y. Research and Development Lab.
G. Baum, and M. Lynn.
Analytica Chimica Acta, Vol 65, No 2, p 393-403, July 1973. 7 fig, 3 tab, 16 ref.

Descriptors: Semipermeable membranes, *Permeability, Fabrication, Selectivity, Permeative membranes, Chemical properties, Physical properties, Electrochemistry, Electrolytes, Electrodes.
Identifiers: *Polymer membrane electrodes, *Potassium electrodes, *Plasticizers, Chemical composition, Phthalate esters, Membrane electrodes, Ion selective electrodes, Diethylphthalate, Liquid membrane electrodes, Diocetylphthalate, Di-nonylphthalate, Diethoxyethylphthalate, Tri(2-ethylhexyl) phosphate, Tricresylphosphate, Phenylidioctylphosphonate, m-Nitrophenyl ether, 3-o-Nitroxylene, p-Hexylnitrobenzene, p-Nitrophenyl ether, o-Nitrophenylbutyl ether.

An ion-selective plasticized polymer membrane electrode of the ion-exchange type is described for potassium. The chemical nature of the plasticizer has a dominant influence on the selectivity of the electrode towards univalent cations. The selectivity ratio was examined over an extended time interval as a function of membrane thickness and plasticizer content. A simplified procedure for the determination of the selectivity ratio of the electrode in mixed electrolyte solutions is proposed and compared with several of the methods which have been described in the literature. (See also W74-00647) (Holoman-Battelle)
W74-00648

A STUDY OF LIQUID-MEMBRANE PERCHLORATE-SELECTIVE ELECTRODES MADE FROM AN ORGANIC RADICAL ION SALT,
Umea Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 05A.
W74-00649

ANION SELECTIVITY STUDIES ON LIQUID MEMBRANE ELECTRODES,
Florida Atlantic Univ., Boca Raton. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W74-00650

CLINICAL LABORATORY EXPERIENCE WITH THE IMPROVED ENTEROTUBE,
Long Island Jewish-Hillside Medical Center, New Hyde Park, N.Y.
For primary bibliographic entry see Field 05A.
W74-00655

GROUNDWATER SURVEY OF THE ERBIL PROJECT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W74-00761

DIRECT MEASUREMENT OF POTASSIUM PERMANGANATE DEMAND AND RESIDUAL POTASSIUM PERMANGANATE,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
For primary bibliographic entry see Field 05A.
W74-00765

ISOTOPE EFFECT AND THE MOLECULAR MECHANISM OF THE SECOND VISCOSITY COEFFICIENT OF WATER,
Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 01A.
W74-00770

BIBLIOGRAPHY OF REPORTS ON THE WATER RESOURCES OF INDIANA PREPARED BY THE U.S. GEOLOGICAL SURVEY, 1886-1972,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 02E.
W74-00814

ADSORPTIVE EXTRACTION FOR ANALYSIS OF COPPER IN SEAWATER,
Woods Hole Oceanographic Institution, Mass.
W. B. Kerfoot, and R. F. Vaccaro.
Limnology and Oceanography, Vol 18, No 4, p 689-693, July 1973. 4 fig, 13 ref. NSF Grant GB-33479 and GI-32140.

Descriptors: *Activated carbon, *Copper, *Water analysis, Trace elements, Water chemistry, Chemical analysis, Adsorption.

Activated carbon can remove trace amounts of complexed and ionic copper from water. Just 10 mg of finely divided carbon is sufficient to concentrate copper from seawater to 700 times its natural level. When the copper is eluted with acid and analyzed by atomic absorption, the results compare well with organic extraction methods now in use, although the accuracy is somewhat reduced. (Knapp-USGS)
W74-00827

DISTRIBUTION OF TRACE METALS IN THE PORE WATERS OF SHALLOW WATER MARINE SEDIMENTS,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.
P. Duchart, S. E. Calvert, and N. B. Price.
Limnology and Oceanography, Vol 18, No 4, p 605-610, July 1973. 1 fig, 2 tab, 23 ref.

Descriptors: *Trace elements, *Pore water, *Bottom sediments, *Sea water, Manganese, Iron, Copper, Nickel, Zinc, Cobalt, Lead.
Identifiers: *Scotland (Lock Fyne).

The concentrations of seven trace metals in the pore waters of marine sediments from Loch Fyne, Scotland, were analyzed by atomic absorption spectrophotometry following solvent extraction. The samples were taken from sediments containing variable amounts of sulfide at depth and variable thicknesses of oxides at the surfaces; one core contains abundant manganese nodules and manganese-calcium carbonate concretions. The distribution of dissolved Mn shows a regular downward decrease in all cores; this is interpreted as an indication of recycling of Mn between solid diagenetic mineral phases and pore solutions. Dissolved Fe, in much lower concentrations, either decreases or increases down the core depending on the type of sediment; Cu, Ni, Zn, Co, and Pb also show variable concentration profiles indicating control by different postdepositional reactions in the sediment, which in turn depend on different physiochemical environments generated by variable amounts of contained organic material and different accumulation rates. (Knapp-USGS)
W74-00828

SEASONAL VARIATIONS OF CADMIUM, COPPER, MANGANESE, LEAD, AND ZINC IN WATER AND PHYTOPLANKTON IN MONTEREY BAY, CALIFORNIA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.

G. A. Knauer, and J. H. Martin.

Limnology and Oceanography, Vol 18, No 4, p 597-604, July 1973. 3 fig, 3 tab, 20 ref.

Descriptors: *Water chemistry, *Cadmium, *Copper, *Manganese, Seasonal, Lead, Zinc, Plankton, *California, Sampling.
Identifiers: *Monterey Bay (Calif.).

Surface water and mixed phytoplankton samples, collected over 1 year in Monterey Bay, California, were analyzed for Cd, Cu, Mn, Pb, and Zn. The phytoplankton appeared to have little effect on the concentrations of these elements in water with the exception of Cd, which decreased during peak periods of productivity. Generally, metal levels in nearshore surface waters appeared to be more dependent on hydrographical fluctuations than on biological factors. Surface water collected on a transect between Hawaii and Monterey was analyzed for these same trace metals, for inshore-offshore comparisons. Levels of Cu, Mn, and Zn were usually higher inshore than offshore especially during periods of strong upwelling. Concentrations of Cd and Pb were almost always an order of magnitude higher inshore. (Knapp-USGS)
W74-00829

CHANGES IN THE CONCENTRATION OF SOLUBLE AND PARTICULATE IRON IN SEA-WATER ENCLOSED IN CONTAINERS,
Washington Univ., Seattle. Dept. of Oceanography.

J. Lewin, and C. Chen.

Limnology and Oceanography, Vol 18, No 4, p 590-596, July 1973. 4 fig, 3 tab, 10 ref. NSF Grant GA-27498.

Descriptors: *Water chemistry, *Sea water, *Iron, *Chelation, Chemical reactions, Chemical precipitation, *Washington.
Identifiers: *Puget Sound (Wash.).

Seawater samples collected along the Washington coast (Puget Sound) were used as sources of naturally occurring iron fractions. Once the water was enclosed in a container, approximately half of the iron in the soluble fraction disappeared and could be quantitatively accounted for by an increase in the iron of the particulate fraction; when the particulate fraction was removed at zero time, soluble iron likewise disappeared, but most of it went onto the walls of the container. The changes were independent of temperature and soluble iron disappeared even when the particulate fraction (including organisms) was removed at zero time, ruling out biological activity. These changes were completed in 30-40 hr. Part of the soluble fraction was ferrous iron. Addition of Na2-EDTA stabilized a portion of the soluble iron equivalent to the ferrous content and kept it from disappearing during the experiment. Ferrous iron may be present in a chelated form in the natural seawater. (Knapp-USGS)
W74-00830

CURRENT PRACTICE IN GC-MS ANALYSIS OF ORGANICS IN WATER,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 05A.
W74-00834

HYDROCHEMICAL ZONALITY OF URAL LAKES (GIDROKHIMICHESKAYA ZONAL'NOST' OZER URALA),
For primary bibliographic entry see Field 02H.
W74-00840

WATER CYCLE—Field 02

Estuaries—Group 2L

ORGANIC MATTER COMPOSITION UNDER DIFFERENT FOREST TYPES IN A DERNO-PODZOLIC ZONE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Pedology.

T. K. Bykovskaya.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 4, p 116-117. 1972. (English summary).

Identifiers: *Derno-Podzolic zone, *Forest types, Fulvic acids, Litter, *Organic matter, Soil profile, Soils, Tree species, *USSR.

The organic matter composition of litter and the upper horizons in some forest soils of Zvenigorodka Biological Station, USSR was studied. Although fulvic acids predominate in the humus, considerable differences were found between individual soil profiles as affected by the tree species and litter composition.—Copyright 1973, Biological Abstracts, Inc.
W74-00984

CONCERNING A NEW GRAPHIC METHOD FOR STUDY OF NATURAL WATERS (IN FRENCH),

Institut National des Sciences Appliquées, Toulouse (France).

H. Roques.
Ann Speleol. Vol 27, No 1, p 79-92, 1972, Illus, English summary.

Identifiers: *Aragonite, *Calcite, Calcium, Carbon dioxide, *Carbonates, *Graphic methods.

A new graphic method for natural water study is being suggested. The proposed graph enables the equilibrium conditions to be determined with respect to calcite and aragonite in terms of the temperature, the ionic force and the concentration in foreign salts at the CO₂-H₂O-CaCO₃ system. A correction which takes into account the Mg complexes is introduced. The content in dissolved CO₂ and the partial pressure of CO₂ in the gaseous phase are also available on this graph.—Copyright 1973, Biological Abstracts, Inc.
W74-01008

COMPLEMENTARY ROLE OF IRON (III), SULFATE AND CALCIUM IN PRECIPITATION OF PHOSPHATE FROM SOLUTION,
Rutgers - The State Univ., New Brunswick, N.J.

Dept. of Soils and Crops.
For primary bibliographic entry see Field 05D.
W74-01053

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1971 WATER YEAR,

Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W74-01086

WATER QUALITY ASSESSMENT PRACTICE IN AUSTRALIA,

Melbourne Water Science Inst. (Australia).
B. J. Lyons, and C. D. Parker.
Australian Water Resources Council Technical Paper No. 4, 1973. 60 p, 18 tab, 93 ref.

Identifiers: *Water analysis, *Chemical analysis, *Water quality, *Analytical techniques, *Australia, Appraisals, Evaluation, Programs, Projects, Surface waters, Groundwater, Laboratory tests, Research and development, Sampling, Monitoring, Networks, Census, Statistics, Documentation.

Details are presented of the findings of a research project, Detection, Identification and Measurement of Water Quality Characteristics, which was supported by the Water Research Fund of the Australian Water Resources Council. The primary aim of the project was to provide a comprehensive review of current Australian practice for use in the work of the Council's Technical Committee on Water Quality and to identify research needs. The

project findings will be of value to a wide range of operational and research bodies concerned with the assessment and management of water resources. The findings are presented in tables and discussed in the text. Documentation of monitoring programs, laboratory procedures for physical, chemical, and biological characteristics is presented. The survey has shown that there exists an extensive field of expertise in this field in Australian laboratories. Apart from the areas indicated, practice in Australian laboratories is based on full appreciation of overseas knowledge. Consideration was also given to research and development both in Australia and overseas on sampling and monitoring procedures and methods used to identify and measure characteristics.
(Woodard-USGS)
W74-01089

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE UPPER COLORADO RIVER BASIN, TEXAS, APRIL 8, 1968,
Geological Survey, Austin, Tex.

For primary bibliographic entry see Field 02E.
W74-01090

2L. Estuaries

STUDIES ON BRACKISH WATER PHYTOPLANKTON,
North Carolina Univ., Chapel Hill. Dept. of Botany.

For primary bibliographic entry see Field 05C.
W74-00589

THE PHYTOPLANKTON OF GALES CREEK WITH EMPHASIS ON THE TAXONOMY AND ECOLOGY OF ESTUARINE PHYTOFLAGELLATES—PART 1 OF STUDIES ON BRACKISH WATER PHYTOPLANKTON,

North Carolina Univ., Chapel Hill. Dept. of Botany.

For primary bibliographic entry see Field 05C.
W74-00590

PHYTOPLANKTON POPULATIONS IN BRACKISH WATER PONDS, A REVISED REPORT—PART II OF STUDIES ON BRACKISH WATER PHYTOPLANKTON,

North Carolina Univ., Chapel Hill. Dept. of Botany.

For primary bibliographic entry see Field 05C.
W74-00591

RESPONSE OF AQUATIC LIFE TO SALINITY, TEMPERATURE, DISSOLVED OXYGEN, AND WATER FLOW,
California Univ., Davis. Dept. of Water Science and Engineering.

For primary bibliographic entry see Field 05C.
W74-00721

POLLUTION EFFECTS ON LITTORAL ALgal COMMUNITIES IN THE INNER OSLOFJORD, WITH SPECIAL REFERENCE TO ASCOPHYLUM NODOSUM,

Norway Inst. of Water Resources, Oslo.

For primary bibliographic entry see Field 05C.
W74-00733

HYDROCARBON INCORPORATION INTO THE SALT MARSH ECOSYSTEM FROM THE WEST FALMOUTH OIL SPILL,

Woods Hole Oceanographic Institution, Mass.

For primary bibliographic entry see Field 05.
W74-00824

ESTUARIES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.

For primary bibliographic entry see Field 07C.
W74-00832

THE TIDAL POWER POTENTIAL OF UNGAVA BAY AND ITS POSSIBLE EXPLOITATION IN CONJUNCTION WITH THE LOCAL HYDROELECTRIC RESOURCES,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.

For primary bibliographic entry see Field 04A.
W74-00838

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX A—THE PEOPLE AND THE ECONOMY.
Corps of Engineers, Baltimore, Md.

1973. 230 P.

Identifiers: *Chesapeake Bay, *Water resources development, *Human population, *Economics, Reviews, Projections, Evaluation, Industries, Agriculture, Urbanization, Construction, Mining, Public utilities.

Appendix A of the Chesapeake Bay Existing Conditions Report contains 6 chapters: (1) Introduction, (2) Economic History, (3) Population Characteristics, (4) Economic Sectors, (5) Economic and Demographic Projections, and (6) Summary. The economic history of the Chesapeake Bay Region contains elements which point toward the future. Height, width, and breadth are combined with time and change to achieve meaning. The chapter on population characteristics is limited to historic and recent demographic trends, and the age and educational levels of the population. The second half of this chapter lists current employment and income figures in the Bay Region. The chapter concerned with economic sectors includes an analysis of the manufacturing, public administration, agriculture, construction, mining, wholesale and retail trade, armed forces, transportation, communications, utilities, services, finance, insurance, and real estate industries. All these sectors are disaggregated, where appropriate, into various components. The chapter on economic and demographic projections includes a program of economic measurement conducted by the Bureau of Economic Analysis and the Economic Research Service. Projection methodology is the main thrust of this section. (See also W74-00888 thru W74-00891 and W74-00924) (Woodard-USGS)
W74-00887

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME I.
Corps of Engineers, Baltimore, Md.

1973, 215 P.

Identifiers: *Chesapeake Bay, *Water resources development, *Land resources, *Land use, Geology, Mineralogy, Soil types, Climatology, Hydrology, Surface waters, Groundwater resources, Aquifer characteristics, Sedimentation, Reviews.

Appendix B, Volume I, of the Chesapeake Bay Existing Conditions Report contains 9 chapters: (1) Introduction, (2) Geology of the Bay Region, (3) Mineral Resources of the Bay Region, (4) Soils of the Basin, (5) Land Use, (6) Climate, (7) Surface Water-Hydrology, (8) Ground Water Resources, and (9) Sedimentation. In developing an effective water-land management program, existing land resources must be carefully defined and understood. Consequently, all of the component elements of Appendix B are, in some way land-oriented. Such things as water quality and supply,

Field 02—WATER CYCLE

Group 2L—Estuaries

groundwater occurrence, runoff, and infiltration, among others, are affected by the nature of specific geologic elements. Geology has a major influence on the occurrence of mineral resources. Both the Piedmont and Coastal Plain Provinces within the Chesapeake Bay Region contain rich resources of economic importance. These mineral resources and their principal areas of location are analyzed. Soil cover is described as it directly affects such physical conditions as streamflow patterns, erosion, and amount and type of flood protection needed. The study area is broken down into major types of land use in order to analyze the present distribution of each. Data are presented on precipitation, temperature, winds, and evaporation as they influence the use made of both the Bay's land and water resources. The drainage basins and the flows of the major tributary rivers to the Bay include the extremes of flow, both floods and droughts, as well as monthly and yearly averages. Ground water and aquifer systems data show areal distribution, yield, and quality characteristics. Federal State, and local sedimentation controls are reviewed to determine their effectiveness, and to point out the need for continued efforts in this area. (See also W74-00887, W74-00889 thru W74-00891 and W74-00924) (Woodard-USGS) W74-00888

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME II.

Corps of Engineers, Baltimore, Md.

310 P, 1973.

Descriptors: *Chesapeake Bay, *Water resources development, *Land resources, *Land use, Water supply, Water quality, Recreation facilities, Electric powerplants, Reviews, Projections, Evaluation.

Appendix B, Volume 2, of the Chesapeake Bay Existing Conditions Report contains 5 chapters entitled Water Supply, Water Quality, Recreation, Power, and Summary. Data on the present water supply facilities in the Chesapeake Bay Region should prove valuable in projecting future water supply needs and planning for the future use of the Bay's water resources. Existing water quality conditions in the Bay and its tidal tributaries are delineated. The beneficial water uses are considered with water quality standards established for the support of these uses. Water problems and inventories of industrial and municipal waste water discharges are presented. The present use and design capacities of recreational facilities on a subregional basis are provided. In addition, the type, location, and capacity of four recreation activities which include swimming, boating, camping, and picnicking are tabulated. Electric power plants on the Bay and its tidal tributaries which are currently in operation or near completion are inventoried. A discussion of the social, economic, biological, chemical, and physical conditions which should be considered in the selection of plant sites also is included, along with an analysis of the effects of thermal additions on the water and land resources. (See also W74-00887, W74-00888, W74-00890, W74-00891 and W74-00924) (Woodard-USGS) W74-00889

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY-PROCESSES AND RESOURCES, VOLUME I.

Corps of Engineers, Baltimore, Md.

1973, 331 P.

Descriptors: *Chesapeake Bay, *Water resources development, *Environmental effects, Beach erosion, Floods, Hurricanes, Navigation, Eutrophication, Aquatic plants, Dredging, Fish, Wildlife, Ecology, Erosion control.

Appendix C, Volume 1, of the Chesapeake Bay Existing Conditions Report contains 6 chapters: (1) Introduction, (2) Shoreline Erosion, (3) Hurricane Flooding, (4) Navigation, (5) Noxious Weeds, and (6) Fish and Wildlife Resources. All of the components of this appendix are, in some way, oriented toward the Bay and its resources. Delineation of areas where significant beach erosion has occurred as well as the rates of erosion are provided. Also discussed are the existing Federal and non-Federal erosion control projects along with the types of action which have been used to retard beach erosion. Important floods of the past, existing flood control measures, and present and potential flooding problems are described. The Bay's foreign and domestic commerce is itemized and quantified, and all Federal and State programs and projects which are supportive of the extensive waterborne traffic are outlined. The types and extent of noxious weeds, problems resulting from plants, current methods of control, and Federal and State control programs are examined as they affect navigation, flood control, agriculture, recreation, fish and wildlife preservation, and property value. (See also W74-00887 thru W74-00889, W74-00891 and W74-00924) (Woodard-USGS) W74-00890

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY-PROCESSES AND RESOURCES, VOLUME II.

Corps of Engineers, Baltimore, Md.

1973, 387 P.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Classification, Environmental effects, Biological communities, Estuaries, Biology, Aquatic life, Ecosystems, Ecotypes, Sediments, Sedimentation, Salinity, Eutrophication, Benthos, Dominant organisms, Bioassay, Water quality, Pesticides, Water pollution sources, Water pollution effects.
Identifiers: *Biota taxonomy.

Appendix C, Volume 2, of the Chesapeake Bay Existing Conditions Report contains 2 chapters: Biota of Chesapeake Bay, and Summary. The existing condition of the biota of the Chesapeake Bay was prepared by the Chesapeake Research Consortium. The Consortium is composed of the Virginia Institute of Marine Science, the University of Maryland, the Johns Hopkins University, and the Smithsonian Institution. Research includes an analysis of biological criteria for environmental change plus two inventories. One is an inventory of biological organisms occurring within the Bay, the other includes research projects, institutions, and scientists involved in biota studies. The intent is to provide data on the existing processes and resources on the Bay so that ultimately a waterland management program can be established. (See also W74-00887 thru W74-00890 and W74-00892 thru W74-00924) (Woodard-USGS) W74-00891

BACTERIA, YEASTS, VIRUSES AND RELATED MICROORGANISMS OF THE CHESAPEAKE BAY.

Georgetown Univ., Washington, D.C. Dept. of Biology.
R. R. Colwell.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-37-C-33, 1973, 15 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Bacteria, *Classification, Water pollution effects, Microorganisms, Sewage effluents, Water pollution sources, Yeasts, Viruses, Water quality, Water analysis, Coliforms, Reviews, Bibliographies.
Identifiers: *Protists taxonomy.

The taxonomy of the yeasts, bacteria, viruses, and other protists, viz., Rickettsia, Chlamydia, and Mycoplasma, is presently under review. Because the taxonomy of the protists is presently in a state of flux, it is best to present taxonomic data as lists of genera within the major orders: Eubacteriales; Pseudomonadales; Hyphomicrobiales; Mycoplasmatales; Rickettsiales; Chlamydobacteriales; Caryophanales; Spirochaetales; Myxobacteriales; and Actinomycetales. Because so little is known about the distribution of protists, other than the bacteria, in Chesapeake Bay, the taxonomical knowledge of groups other than the bacteria cannot be discussed profitably. Bacteria are widely distributed in Chesapeake Bay water and sediment and are found in association with the aquatic flora and fauna of the Bay. Total viable aerobic heterotrophic bacterial populations range from 100-1,000 per ml in water and 10,000-100,000 per gm in sediments. The species distribution of bacteria is related to the available substrate (s). Mercury-tolerant bacteria are found in the industrial spoil dumping areas, and variations in the bacterial flora have been found to occur with respect to geographical location within the Chesapeake Bay. Clearly, pollution of the Bay with new or incomplete sewage treatment raises the total bacterial load and introduces coliform bacteria. (See also W74-00891) (Woodard-USGS) W74-00893

FUNGI OF THE CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Botany.
C. A. Shearer.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-34-C-36, 1973, 18 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic fungi, *Classification, Estuaries, Environmental effects, Soils, Ecosystems, Ecology, Salinity, Water temperature, Biology, Water pollution effects, Reviews, Bibliographies.

Identifiers: *Fungi taxonomy.

Representatives of all major groups of fungi are known to occur in estuaries, and although a large number of species of fungi have been reported from estuaries, there have been few taxonomic studies of fungi in the Chesapeake Bay. Aquatic Phycomycetes in soils bordering the Patuxent River and the wood-inhabiting Ascomycetes and Fungi Imperfecti of the Patuxent River have been studied. The distribution of wood-inhabiting Ascomycetes and Fungi Imperfecti in the Patuxent River is affected by changes in salinity while the distribution of aquatic Phycomycetes in soils surrounding the upper Patuxent estuary is not affected by changes in salinity. Comprehensive and regular sampling for fungi is necessary before any generalizations about the distribution and abundance of fungi in the Bay can be made. Little is known about the sensitivity of estuarine fungi to man-induced environmental changes. In the Patuxent River, the addition of heated water during the summer months caused a decrease in the number of species and a replacement of the dominant species by another species common only at warm temperatures. (See also W74-00891) (Woodard-USGS) W74-00894

NANOPLANKTON OF THE CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Botany; and Maryland Univ., Solomons. Natural Resources Inst.

S. D. Van Valkenburg.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-37-C-39, 1973, 4 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Nannoplankton, *Classifi-

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Estuaries—Group 2L

cation, Estuaries, Water pollution sources, Pollutant identification, Aquatic life, Phytoplankton, Microorganisms, Reviews.

Identifiers: *Nannoplankton taxonomy.

The large majority of extant phytoplankton organisms is poorly known taxonomically, principally because only a relatively small number of species have been cultured. A number of diatoms and dinoflagellates and blue-green algae have been listed for Chesapeake Bay. However, very few nannoplankton or microp plankton (herein designated as flagellated or coccoid photosynthetic, planktonic organisms of under 10 micro meters in diameter) have been reported for Chesapeake Bay. These omitted groups cover a large taxonomic area, including the Chrysophyceae, Haptophyceae, Xanthophyceae (or Xanthophyta), many of the Chlorophyceae, and all of the Crytophyta. Studies of primary production using C-14 and chlorophyll measurements have been made in Chesapeake Bay. Work is in progress to measure size fractionization of phytoplankton at specific locations in the Bay with reference to C-14 uptake, chlorophyll a, and species composition. Preliminary data indicate the contribution of the smaller organisms may approximate 50 percent of total production in the late winter months. Although the number of species of nannoplankton that have been adequately studied is relatively small, it is probable that these forms may have utility as indicator species for pollution levels in the Chesapeake Bay. (See also W74-00891) (Woodard-USGS)
W74-00895

PHYTOPLANKTON OF THE CHESAPEAKE BAY, Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.

R. A. Mulford.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-40-C-56, 1973. 22 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Phytoplankton, *Classification, Estuaries, Nannoplankton, Aquatic life, Microorganisms, Environmental effects, Water temperature, Salinity, Diatoms, Biology, Ecosystems, Ecology, Reviews, Bibliographies.
Identifiers: *Phytoplankton taxonomy.

Organisms included in this Chesapeake Bay phytoplankton summary belong to four plant divisions and 10 classes. They are primarily the diatoms, dinoflagellates, silicoflagellates, planktonic green and blue-green algae and the micro flagellates, often referred to as the ultraplankton or nannoplankton. Thirty-six species have been selected from an initial listing of 613. Six percent of the total Bay phytoplankton species probably account for the majority of planktonic biomass exclusive of ultraplankton. Generally, diatoms are most abundant in the fall, winter, and spring period when water temperatures are below 20 deg C. However, temperature does not necessarily seem to be an important indicator of population density. Other parameters such as nutrients, day length, and turbidity are probably more significant. Planktonic diatom populations in the lower Bay are generally more diverse with a mixing of estuarine and marine or oceanic species. With the reduced salinity gradient near mid-Bay, many of the lower Bay forms disappear from the community and their place is taken by other species of green algae. Consequently, the Bay populations from the mouth to head mimic the river communities with their subsequent salinity gradients. (See also W74-00891) (Woodard-USGS)
W74-00896

BENTHIC MACROALGAE OF THE MARYLAND PORTION OF THE CHESAPEAKE BAY, Maryland Univ., College Park. Dept. of Botany. R. W. Krauss, and P. Orris.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-57-C-59, 1973. 2 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Benthos, *Aquatic algae, Estuaries, Classification, Environmental effects, Ecosystems, Ecology, Water pollution effects, Phosphates, Nutrients, Water temperature, Heavy metals, Reviews.
Identifiers: *Benthic Macroalgae taxonomy.

Records of benthic macroalgae (Xanthophyta, Chlorophyta, Phaeophyta, Rhodophyta) found in upper Chesapeake Bay are primarily from specimens housed in the University of Maryland Algal Herbarium (Department of Botany). A preliminary checklist was prepared from this collection, and further verification of these specimens is presently underway. No data is published on the distribution and abundance of macroalgae in the upper Bay. A better understanding of the largely unknown basic biology of benthic macroalgae would greatly aid in predicting the effect of man-induced environmental changes. Specifically, one needs to understand the metabolism of nutrients, such as phosphorus and nitrogen, in algae in order to predict the effect of phosphorus- and nitrogen-rich waste additions. The effect of temperature on photosynthesis, respiration, and growth rates, as well as life cycles and reproduction, must be understood to predict the effect of thermal additions or changes by man. The concentration of heavy metals at the base of the food web, the destruction of certain algae, or the enhancement of others to nuisance proportions has the potential of being detrimental to the entire biota of an area. (See also W74-00891) (Woodard-USGS)
W74-00897

MACROALGAE OF THE CHESAPEAKE BAY, Virginia Inst. of Marine Science, Gloucester Point. F. D. Ott.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-60-C-62, 1973.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic algae, *Estuaries, Ecosystems, Classification, Water pollution sources, Water pollution effects, Environmental effects, Sewage effluents, Industrial wastes, Reviews.
Identifiers: *Macroalgae taxonomy.

There are approximately 213 taxa known for macroalgae flora along the Atlantic coasts of Maryland and Virginia including the Chesapeake Bay area. These are distributed into four algal divisions: Chlorophyta, taxa 55, percent 25.8; Phaeophyta, taxa 29, percent 13.6; Rhodophyta, taxa 54, percent 25.4; and Cyanophyta, taxa 75, percent 35.2. Much work remains to be done. The initial statement does not imply that all taxa for the area have been determined. Little information is available concerning the macroalgal flora of the salt marshes and of the deeper waters of the Chesapeake Bay and off the Virginia and Maryland coasts. The greatest population densities among the macroalgae are found on manmade structures (jetties, etc.). At dilute levels, sewage may cause luxuriant development of algae with the Ulvales, i.e., *Ulva*, Enteromorpha, being the last group of macroalgae to be adversely affected as the level of pollution increases. At very high levels of sewage pollution only blue-green algae are found. The effect on macroalgae of toxic inorganic and organic substances which may be released into the water by various industries is unknown. (See also W74-00891) (Woodard-USGS)
W74-00898

BRYOPHYTES AND LICHENS OF THE CHESAPEAKE BAY, Maryland Univ., College Park. Dept. of Botany. A. B. Owens.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-63-C-64, 1973. 8 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Lichens, *Estuaries, Ecosystems, Ecology, Classification, Environmental effects, Water pollution sources, Water pollution effects, Air pollution, Air pollution effects, Reviews, Bibliographies.
Identifiers: *Bryophytes, *Lichens taxonomy.

An extensive survey of the bryophytes which occur throughout the States of Maryland and Virginia has been made, although many areas need to be studied intensely. One such area is the Chesapeake Bay at its high tide line. A taxonomic survey of the lichens has not been made. There are no known aquatic lichens in this latitude. However, lichens do contribute to the biomass in the wetlands. There are no known bryophytes in salt or brackish water. However, some occur at the base of the Bay banks where they are in contact with lapping waves during extreme high tides. Several species are of frequent occurrence along the margins of the tributaries in the upper region of the Chesapeake Bay and its tributaries. Little data are available on the distribution of these plants in the lower region of the Bay. One lichen species, *Caloplaca citrina* (Hoffm.) Th.Fr., occurs abundantly on concrete within the spray zone along the Bay. The possible effects on the bryophytes of man-induced changes are not known. It is likely that changes in temperature would be detrimental to those few bryophytes which are truly aquatic. Lichens are natural indicators of air pollutants. Industrial and auto waste materials in the air are absorbed and accumulated within the lichen thallus. When a toxic level is reached the lichen dies. (See also W74-00891) (Woodard-USGS)
W74-00899

VIRUSES OF AQUATIC PLANTS OF THE CHESAPEAKE BAY, Maryland Univ., College Park. Dept. of Botany. M. K. Corbett.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-65-C-67, 1973. 12 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Viruses, *Biota, *Aquatic plants, Plant viruses, Classification, Estuaries, Ecosystems, Ecology, Water pollution sources, Water pollution effects, Biology, Aquatic microorganisms, Reviews, Bibliographies.
Identifiers: *Viruses taxonomy.

Little is known about the distribution of viruses of aquatic plants in the Chesapeake Bay. However, most plants, especially those of agronomic and horticultural importance, have been reported to suffer the adverse effects of viruses. Viral-like particles have been reported from a variety of cryptogamic hosts including the aquatic Phycomycete *Aphelidium* sp.; *Agaricus bisporus*; *Peziza ostracoderma*; *Penicillium* spp.; the green alga *Chlorella pyrenoidosa*; the freshwater red alga *Serodotia tenuissima*; the green alga *Oedogonium* sp.; and the marine brown alga *Chorda tomentosa*. Viruses have also been studied in the procarotic blue-green algae and bacteria. A disease of Eurasian milfoil (*Myriophyllum spicatum*) was studied in the Chesapeake Bay by Bayley, et al, and was reported to be viral in nature. (See also W74-00891) (Woodard-USGS)
W74-00900

SUBMERGED VASCULAR PLANTS OF THE CHESAPEAKE BAY AND TRIBUTARIES, American Univ., Washington, D.C. Dept. of Biology.

R. R. Anderson.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-68-C-71, 1973. 13 ref.

Field 02—WATER CYCLE

Group 2L—Estuaries

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Submerged plants, *Vascular tissues, Classification, Estuaries, Aquatic populations, Ecosystems, Ecology, Fish, Wildlife, Water pollution effects, Water pollution sources, Nutrients, Salinity, Reviews, Bibliographies.
Identifiers: *Submerged vascular plant taxonomy.

Submerged vascular plants are widely distributed in the Chesapeake Bay and tributaries wherever shallow, quiet, and relatively clean waters are present. Little is known of population fluxes, interspecies relationships, or rates at which new areas may be colonized. Extensive rhizone systems shallowly buried in the bottom muds provide the bulk of reproductive potential. Water salinity and bottom type appear to be the major environmental factors controlling species distribution. The general roles that submerged plants play in aquatic ecosystems is well known. These include bottom stabilization, water oxygenation, shelter and food for young fish, and flood for wildfowl. There is some documentation on wildfowl use of aquatic vegetation in the Bay. *R. maritima*, *V. americana*, *C. demersum*, *Z. marina* are considered to be very important food sources for resident and migrating waterfowl. There have been population explosions of some species which appear to be related to nutrient pollution. *Elodea canadensis* and *Myriophyllum spicatum* have at times been plant pests, the latter being most serious during the last 10 years. *Ruppia maritima* has been very sensitive to increases in water turbidity. (See also W74-00891) (Woodard-USGS)
W74-00901

EMERGENT VASCULAR PLANTS OF CHESAPEAKE BAY WETLANDS,

Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
D. Hignan.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-72-C-80, 1973. 3 tab, 17 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Vascular tissues, *Wetlands, Classification, Ecosystems, Ecology, Water pollution sources, Water pollution effects, Dredging, Engineering structures, Sewage effluents, Environmental effects, Salinity, Biology, Reviews, Bibliographies.
Identifiers: *Emergent vascular plant taxonomy.

Two annotated checklists have recently been compiled for vascular plants of the Chesapeake Bay and areas potentially subject to flooding by it (Krauss et al, 1971; Wass, 1972). The Maryland list of 421 species covers all land areas within the high tide limits of the Bay and its tributaries, both in Maryland and Virginia. The Virginia Institute of Marine Sciences (VIMS) list of 435 species is restricted to Virginia (including the barrier islands of the Atlantic seashore) and the Patuxent River estuary in Maryland. Both lists include the flora of salt and brackish marshes, beaches, and freshwater swamps. The VIMS also covers ponds and floodplains on tidal creeks and shores subject to storm wave inundation. Each list contains many species not found in the other, so together they probably comprise a fairly complete flora of Chesapeake Bay wetlands. Since the distribution of many salt marsh species depends to some degree upon salinity, engineering projects which alter the salinity of portions of the Bay likewise alter the floristic composition of salt marshes in the affected areas. Pollution by sewage raises the level of nutrients in salt marshes. Wass and Wright (1969) noted that *Spartina* spp. grows taller and has a darker green color than normal when sewage is present. During the growing season, salt marshes are able to absorb some of the excess nutrients which otherwise would create algal blooms in the estuaries. (See also W74-00891) (Woodard-USGS)
W74-00902

VASCULAR PLANTS OF THE CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Botany.
R. G. Brown, and J. L. Reveal.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-81-C-86, 1973. 40 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Vascular plants, *Aquatic life, Estuaries, Classification, Ecosystems, Ecology, Water pollution sources, Water pollution effects, Dredging, Environmental effects, Biology, Salinity, Reviews, Bibliographies.
Identifiers: *Vascular plant taxonomy.

Most of the vascular plants found in and around Chesapeake Bay are taxonomically well known and understood. The food produced by photosynthesis in vascular plants is of utmost importance. Much of this is consumed directly as fruits, seeds, or vegetative tissue by various mammalian and avian species of the marshes and open water. Vascular plants provide stability to aquatic and sandy habitats. Both of these habitats are currently being subjected to increasing stress from urbanization and from dredge and fill operations. It is lamentable that the technology that might permit artificial propagation of selected species (such as *Zostera*, *Juncus*, etc.) does not currently exist. Such technology could provide for reclamation of dredged areas, reduce erosion losses, and allow for a greater number of management options. Vascular plants are extremely sensitive indicators of environmental change. They have been suggested or used as indicators for air pollution levels, ambient radioactivity levels, chemical and nutrient levels of the substrate, and as microclimatological indicators. (See also W74-00891) (Woodard-USGS)
W74-00903

FREE-LIVING PROTOZOA OF THE CHESAPEAKE BAY EXCLUSIVE OF FORAMINIFERA AND THE FLAGELLATES,

Maryland Univ., College Park. Dept. of Zoology.
E. B. Small.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-87-C-89, 1973. 8 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Protozoa, Classification, Biology, Estuaries, Ecosystems, Ecology, Water pollution sources, Water pollution effects, Sewage effluents, Salinity, Environmental effects, Reviews, Bibliographies.
Identifiers: *Protozoa taxonomy.

The free-living protozoa discussed include the ciliaphora and amoeboid sarcodinids. The biology of the free-living protozoa within the Chesapeake Bay is understood only by analogy to those protozoan organisms studied in other estuarine communities. Protozoa generally feed on a wide variety of foodstuffs at the very base of the food pyramid (e.g. bacteria, fungi, unicellular algae, blue-green algae, other protozoa, tissues of metaphytan and metazoan organisms) and excrete nitrogen and phosphorus into their aquatic environments. Since bacteria are known to be a major component of waste water derived from sewage disposal plants, the bacterivorous ciliates probably play a major role in and form a prominent part of the biomass living in highly polluted estuarine waters. (See also W74-00891) (Woodard-USGS)
W74-00904

FORAMINIFERA OF THE CHESAPEAKE BAY,

Smithsonian Institution, Washington, D.C. Dept. of Paleobiology.
M. A. Buzas.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-90-C-91, 1973.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Protozoa, Classification, Estuaries, Ecosystems, Ecology, Water pollution sources, Water pollution effects, Sewage effluents, Environmental effects, Salinity, Water temperature, Oxygen, Reviews.
Identifiers: *Foraminifera taxonomy.

Chesapeake Bay Foraminifera have been inadequately studied. The Virginia Institute of Marine Sciences (VIMS) 1972 checklist cites 21 species belonging to seven families. New observations here have enlarged this to 28 species and 14 families. Two biofacies in the Rappahannock and Choptank estuaries contain as principals the genera Ammobaculites and Elphidium. In marshes the two principal biofacies are dominated by Milammina and Ammoastuta. Monthly sampling with replicates at three stations over the period of a year in the Choptank River indicate that the genera Ammobaculites, Elphidium, and Ammonia vary in their periodicity among themselves as well as between stations. This periodicity can be accounted for in part by temperature, salinity, oxygen, chlorophyll a, b, and c. No single environmental variable can account for the observed periodicities. General linear models containing 15 parameters successfully accounted for the variability of each species. The distribution of the Foraminifera in the other rivers of the bay system are documented. The Foraminifera are mainly herbivores. In those species studied the principal food has been diatoms. Bacteria, however, have also been demonstrated as a requirement to successfully maintain some cultures. (See also W74-00891) (Woodard-USGS)
W74-00905

CTENOPHORES OF THE CHESAPEAKE BAY,

Richmond Univ., Va.
J. W. Bishop.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-92-C-95, 1973. 20 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Jelly fish, Classification, Estuaries, Aquatic life, Ecosystems, Ecology, Environmental effects, Water pollution effects, Nutrients, Food chains, Reviews, Bibliographies.
Identifiers: *Ctenophore taxonomy.

Ctenophores commonly are called water gulls, comb jellies, sea walnuts, and jellyfish. *B. ovata* ranges from the Tropical Atlantic to the Chesapeake Bay. In the Chesapeake Bay, it is found at salinities above 15 ppt and is most abundant during late summer and early fall. Its abundance in the Bay may be controlled largely by hydrological factors. Field observations of the vertical distributions of ctenophores indicate that *M. leidyi* is found at a variety of depths, but is attracted to light and tends toward greater depths in rough weather and in low salinities. Smaller individuals concentrate within currents near the bottom and therefore may be carried upstream in an estuary. *M. leidyi* eats a wide variety of zooplankton up to about 6 mm in length. When it is abundant, crustacean zooplankton and oyster sets often are reduced. Its predatory activities can account for 73% of the total predation on small zooplankton in the York River and 52% of the daily mortality of the predominant copepod *Acartia tonsa* in the Patuxent River. Ctenophores eliminate about 90% of assimilated nitrogen and therefore may play an important role in recycling nutrients. (See also W74-00891) (Woodard-USGS)
W74-00906

CNIDARIA OF THE CHESAPEAKE BAY,

Virginia Inst. of Marine Science, Gloucester Point.
D. R. Calder.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-96-C-99, 1973. 33 ref.

WATER CYCLE—Field 02

Estuaries—Group 2L

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Invertebrates, Jelly fish, Aquatic life, Classification, Ecosystems, Ecology, Estuaries, Water pollution effects, Environmental effects, Water temperature, Salinity, Oxygen demand, Reviews, Bibliographies.
Identifiers: *Cnidaria taxonomy.

The hydrozoans and scyphozoans of Chesapeake Bay are well known taxonomically. The four species of scyphomedusae occurring in the Bay are easily distinguished, and problems in the identification of their scyphistomae and ephyrae have been resolved. Ten species of anthozoans are known from the area, but the class has not been adequately studied. Well established common names exist for the scyphomedusae, including the sea nettle (*Chrysaora quinquecirrha*), the moon jelly (*Aurelia aurita*) and the lion's mane (*Cyanea capillata*). Only one hydroid, the abundant and conspicuous *Sertularia argentea*, has a common name. It is referred to as grass by fishermen and the silvery hydroid or thuiaria by marine scientists. Among anthozoans, *Astrangia danae* is called the star coral. Within the Hydrozoa, salinity and temperature optima vary widely from one species to another. Some (*Cordylophora caspia*, *Moerisia lyonsi*) are restricted to low salinities, while others (*Tubularia crocea*, *Hydractinia echinata*) occur only in higher salinities. Species composition changes markedly from summer to winter. With the possible exception of *Nemopsis bachei*, no species is known to remain active throughout the year. Scyphistomae are tolerant of low oxygen levels, although well oxygenated water may be necessary for strobilation. (See also W74-00891) (Woodard-USGS)
W74-00907

PRIAPULIDA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.
R. P. Higgins.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-100-C-101, 1973. 1 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Invertebrates, Classification, Estuaries, Ecosystems, Ecology, Environmental effects, Water temperature, Salinity, Oxygen demand, Water pollution effects, Reviews.
Identifiers: *Priapulida taxonomy.

No priapulida have been reported for the Chesapeake Bay. This presentation is submitted on the basis that it is possible that one or more species could be present in the Bay. Two species have been reported from the eastern coastal waters of the U.S. (New England): *Priapulus caudatus* and *Priapulopsis bicaudatus*. Priapulids are widely distributed but usually prefer cold water habitats. One exception is *Tubiluchus corallicola*, found in shallow, tropical waters. If present in the Bay, they will fill a minor benthic predator niche and offer a negligible food source to vertebrates and invertebrates. Priapulids are capable of withstanding wide variations in salinity (4 ppt to 65 ppt) and moderately low oxygen concentrations (2 ml per liter). (See also W74-00891) (Woodard-USGS)
W74-00908

TARDIGRADA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.
R. P. Higgins.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-102-C-104, 1973. 6 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Invertebrates, Classification, Estuaries, Ecosystems, Ecology, Environmental effects, Salinity, Sediments, Water pollution effects, Oxygen demand, Reviews, Bibliographies.

ments, Water pollution effects, Oxygen demand, Reviews, Bibliographies.
Identifiers: *Tardigrada taxonomy.

Tardigrades, occasionally called water bears, constitute a well defined taxonomic group of aquatic invertebrates rarely exceeding 1 mm in length. The greater number of described species are found in freshwater. Many species are ubiquitous, however very little is known about their distribution. Many species, several of which are marine, are capable of cryptobiosis (drying) and may be distributed by wind. Nine species have been reported from marine or estuarine environments on the eastern U.S. coast. Four of these are reported from Chesapeake Bay: *Batillipes mirus*, *B. bullacaudatus*, *Stygarcus bradyi* and *Halechinus remanei*. Considering the habitats of Chesapeake Bay, many marine and freshwater species should be expected in collections of meiobenthic invertebrates. Although the average sediment sample contains very few tardigrades, many thousands per cubic liter may occur in some habitats, especially in moist beach sand. Tardigrades feed on algae and other plants and small invertebrates, including other tardigrades. Post-embryonic development is direct. Some tardigrades are moderately tolerant of low oxygen tension and variation in temperature and salinities. (See also W74-00891) (Woodard-USGS)
W74-00909

KINORHYNCHA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.

R. P. Higgins.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-105-C-107, 1973. 11 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Invertebrates, Classification, Estuaries, Ecosystems, Environmental effects, Salinity, Sediments, Water temperature, Reviews, Bibliographies.
Identifiers: *Kinorhyncha taxonomy.

To date no kinorhyncha has been reported from the Chesapeake Bay. Representatives of at least four genera—*Pycnophyes*, *Trachymus*, *Echinoderes*, and *Centroderes*—are found. Kinorhynchs are widely distributed in marine and estuarine sediments from intertidal to abyssal depths, at salinities from 7 ppt to 60 ppt but more normally within a range of 18 ppt to 40 ppt and at all latitudes from the Arctic to Antarctic. Kinorhynchs are small (less than 1 mm), bilaterally symmetrical, appendageless pseudocoelomate worms which have the distinction of being the only aschelminth with distinct external, (integument) and to some extent internal (muscles and nervous system) segmentation. They are an important and ubiquitous constituent of the meiobenthos in marine and estuarine sediments. They remain cryptic primarily because of difficulties in processing and identifying them. However, they generally constitute a moderately important part of the meiobenthos, serving as a source of food for sediment feeders, and themselves feeding on diatoms, other microalgae, and detritus. (See also W74-00891) (Woodard-USGS)
W74-00910

DIGENETIC TREMATODES OF THE CHESAPEAKE BAY,
Gulf Coast Research Lab., Ocean Springs, Miss.

R. M. Overstreet.
Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-108-C-110, 1973. 7 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Invertebrates, Classification, Ecosystems, Estuaries, Worms, Parasitism, Ecology, Environmental ef-

fects, Biology, Fish diseases, Reproduction, Reviews, Bibliographies.
Identifiers: *Trematode taxonomy, Flatworm, Parasites.

The taxonomy of Digenea from fishes and invertebrates from Chesapeake Bay is in need of considerable attention. The viscera from several preserved fishes from the Bay were examined for parasites for a list of parasites. Most of the fish were infected with Digenea and most were new records for the parasite to be found in the particular host and in the Bay area. These findings suggest that Digenea are abundant and their distribution poorly known. The biology of several trematodes from near Woods Hole and from other areas along the Atlantic coast have been studied. Some of the studied worms probably occur in the Bay. In general, however, the life histories and other aspects of the biology of marine and estuarine trematodes are poorly understood. Digenea are especially valuable as indicators of environmental conditions. Molluscs are the first intermediate host for all known Digenea but two. In order for a trematode larva to infect a mollusc and asexually produce larvae capable of infecting a second intermediate host, the trematode must depend on both a receptive host and satisfactory environmental conditions. Proper conditions are also necessary for development in the second or addition intermediate hosts and in the definitive host. (See also W74-00891) (Woodard-USGS)
W74-00911

MOLLUSCS OF THE CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.

H. T. Pfizenmeyer.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-111-C-127, 1973. 154 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Mollusks, Classification, Estuaries, Invertebrates, Shellfish, Ecosystems, Ecology, Environmental effects, Water temperature, Salinity, Sediments, Water pollution effects, Biology, Reviews, Bibliographies.
Identifiers: Molluscs taxonomy.

Molluscs in Chesapeake Bay are generally well defined on the generic and specific level. The most comprehensive list for all molluscs of the Bay contains 121 species. It is most complete for the lower Bay area but also contains most of those species found in the Maryland or upper portion of the Bay. Most Bay research has centered on three commercial species, the oyster, *Crassostrea virginica*; the soft-shell clam, *Mya arenaria*; and the hard-shell clam, *Mercenaria mercenaria*. The oyster, the most economically important species, has been well studied with respect to its distribution and variable abundance in the Bay. Perhaps the greatest contribution any single mollusc makes towards the ecology of the Bay would be the formation of shell bars and reefs by oysters. The shell surfaces of live and dead oysters provide the necessary hard substrate and crevices for the attachment of a great number of animals and plants which cannot exist on mud or sand bottoms. Alteration of the Chesapeake Bay by chemical and physical means reduces populations of desirable food species for man or for other species lower in the food chain or creates an unhealthy environment. (See also W74-00891) (Woodard-USGS)
W74-00912

POLYCHAETES OF THE CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.

D. H. Hamilton, Jr.
In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-128-C-131, 1973. 8 ref.

Field 02—WATER CYCLE

Group 2L—Estuaries

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Worms, Classification, Invertebrates, Estuaries, Ecosystems, Biology, Environmental effects, Sediments, Salinity, Water temperature, Water pollution effects, Reviews, Bibliographies. Identifiers: *Polychaete taxonomy.

With the exception of larval stages, the taxonomy of the Chesapeake Bay polychaetes is well worked out, partially as a consequence of the restricted diversity of the fauna, which totals only about 110 species in all. Polychaetes are ubiquitously distributed in the Bay, colonizing not only sediments but also Aufwuchs (periphyton) communities, oyster bars, and virtually every other subsurface substratum. Members of the class occur throughout the range of salinities and temperatures encountered in the Bay. In sandy habitats they are second in importance among the macroscopic infauna only to the bivalves. In silt-clay habitats they are normally the most abundant macrofauna (greater than 1 mm. in shortest dimension) and constitute a major component of the biomass in all sediments. Polychaetes seem to be much more resistant to man-induced environmental changes than crustaceans or molluscs, and may be of particular value in the study of such problems. Recent work at Chesapeake Biological Laboratory has shown that even in grossly polluted areas of Baltimore Harbor, large populations of polychaetes may be found. *Nereis succinea* seems to occur preferentially and at considerable densities (400/sq.meter) in a partially anaerobic ooze with high organic content near Cove Point. (See also W74-00891) (Woodard-USGS) W74-00913

FREE-LIVING COPEPODA OF THE CHESAPEAKE BAY, Maryland Univ., Solomons. Natural Resources Inst.

D. R. Heinle.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-132-C-135, 1973. 18 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Copepods, Classification, Estuaries, Invertebrates, Ecosystems, Biology, Ecology, Water pollution effects, Environmental effects, Salinity, Water temperature, Reviews, Bibliographies. Identifiers: *Copepoda taxonomy.

Of the 73 species of copepods listed from Chesapeake Bay about five are abundant. The calanoid *Acartia tonsa* (Dana) is found throughout the year at all salinities but is most abundant from April to October. Population densities are commonly 100,000 to 200,000 individuals per cubic meter and sometimes exceed 1,000,000 during that period. During winter and early spring *A. tonsa* exceeded by the calanoids *A. clausi* at higher salinities and *Eurytemora affinis* (Poppe) at lower salinities. *Acartia clausi* occurs to salinities as low as 5 ppt (Baltimore Harbor) and *E. affinis* to salinities as high as 12 ppt (mid-Bay). Densities of both of these species are commonly in excess of 200,000 per cubic meter, and *E. affinis* at times exceeds 3,000,000. The relatively small *Oithona brevicornis* (Biesbrach) is found at higher salinities greater than 10 ppt all year but appears to breed during the summer months when it achieves greatest densities. This species is epibenthic in habit. Adults and immature copepodites of this species at times exceed 100,000 per cubic meter. The harpacticoid *S. canadensis* has pelagic nauplii which at times exceed 1,500,000 per cubic meter. The adults of this species are epibenthic. (See also W74-00891) (Woodard-USGS) W74-00914

DECAPOD CRUSTACEANS OF THE CHESAPEAKE BAY, National Marine Fisheries Service, Washington, D.C.

A. B. Williams.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-136-C-139, 1973. 25 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Crustaceans, Classification, Estuaries, Biology, Ecosystems, Environmental effects, Salinity, Water temperature, Water pollution effects, Pesticides, Ecology, Reviews, Bibliographies. Identifiers: *Decapod taxonomy.

Most of the decapod species found in the Chesapeake Bay are taxonomically stable. Manuals for identification and an annotated check list for Bay species are available which provide both systematic and distributional information. Salinity and temperature are the dominant factors governing distribution of estuarine animals. Some species are better adapted to life in Chesapeake Bay than others, and the abundant Callinectes, *Palaemonetes* and xanthid species, as well as some *Uca*, are dominant decapod crustaceans there. The remaining species listed range from accidental oceanic intruders, through seasonal residents, to moderately tolerant forms confined largely to the lower Bay. *Upogebia* and *Polyonyx* are tube dwellers, the latter a commensal with annelids as are some of the pinnotherid crabs, while two of the pinnotherids are essentially parasites in mollusks. Probably the most imperfect state of knowledge is that regarding reactions of these animals to induced environmental changes. *Penaeus* and *Callinectes* are differentially affected by pesticides and herbicides (DDT, Dibron, Antimycin A, Strobane, BHC, Dieldrin, Dursban, Parathion, 2,4-D acetamide, among those tested) depending on pollutant, concentration, and length of exposure. (See also W74-00891) (Woodard-USGS) W74-00915

FISHES OF THE CHESAPEAKE BAY, Virginia Inst. of Marine Science, Gloucester Point.

J. Musick, and M. L. Wiley.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-141-C-142, 1973.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Aquatic life, *Fish, Classification, Estuaries, Biology, Ecosystems, Environmental effects, Water pollution effects, Dredging, Industrial wastes, Ecology. Identifiers: *Fish taxonomy.

The fishes are a very conspicuous and important component of the fauna of Chesapeake Bay. The taxonomic status of the group is probably understood as well for the Bay as any other comparable geographic area but much work remains to be done at the subspecific and racial levels. Least known is the seasonal occurrence of large adult marine species, particularly sharks. Commercial fisheries catch statistics provide crude estimates of the relative abundance of commercially important species from year to year. Some species of fish inhabit nearly every available habitat within the Bay, and collectively they consume at all zooplankton (anchovies, silversides) and bottom invertebrates (hogchoker, white perch). Some are generalized predators (Striped bass) while others live mainly on molluscs (drums, cownosed rays), fishes (bluefish), or crustaceans (oyster toadfish). The effects of individual environmental changes (dredging, thermal or chemical pollution, etc.) have been determined for certain species. The possible effects of each one of all the major changes which have or are likely to occur in the Bay system have not been determined for a single species. (See also W74-00891) (Woodard-USGS) W74-00916

AMPHIBIANS OF THE CHESAPEAKE BAY REGION, Maryland Univ., Solomons. Natural Resources Inst.

J. D. Hardy, Jr.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report Append C, Vol 2, p C-143-C 153, 1973. 48 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Amphibians, Classification, Estuaries, Biology, Frogs, Salamanders, Toads, Ecosystems, Environmental effects, Water pollution effects, Pesticides, Ecology, Reviews, Bibliographies. Identifiers: *Amphibian taxonomy.

A list of 43 species and subspecies of amphibians known to occur on the Atlantic Coastal Plain in the latitudes of Chesapeake Bay is presented. The range of *Eurycea longicauda guttata* ends abruptly at the Potomac River where it is replaced (but only west of the Fall Line) by *Eurycea l. longicauda*. Two disjunct populations of frogs occur in the Maryland portion of the Chesapeake Bay region: *Gastrophryne carolinensis* is known only from St. Marys, Calvert, and Dorchester Counties, while *Rana virgatipes* is limited to the southern portion of the eastern shore. Tadpoles are usually regarded as vegetarians, but are occasionally carnivorous, and sometimes cannibalistic. Salamander larvae and adult toads, frogs, and salamanders are entirely carnivorous, and primarily insectivorous. Studies of DDT accumulations in *Acrit crepitans*, *Rana pipiens*, *Rana clamitans*, and *Rana catesbeiana* are reviewed. Adult frogs usually contain lower amounts of residues than fish, snakes, and birds. Even sublethal doses of DDT cause radically abnormal behavior in tadpoles. (See also W74-00891) (Woodard-USGS) W74-00917

REPTILES OF THE CHESAPEAKE BAY REGION, Maryland Univ., Solomons. Natural Resources Inst.

J. D. Hardy, Jr.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-154-C-164, 1973. 36 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Reptiles, Classification, Estuaries, Snakes, Turtles, Biology, Ecosystems, Environmental effects, Water pollution effects, Pesticides, Ecology, Reviews, Bibliographies. Identifiers: *Reptile taxonomy.

Fifty-eight species and subspecies of reptiles are listed that occur in the Chesapeake Bay region. Three turtles (*Clemmys insculpta*, *Clemmys muhlenbergii*, and *Malaclemys geographica*) are predominately upland or northern species which reach the Atlantic Coastal Plain only at the head of the Chesapeake Bay. One snake, *Regina septemvittata*, is predominately a piedmont species, but encroaches on the coastal plain in both Maryland and Virginia. Most of the regional reptiles show a definite habitat preference, but are not wholly restricted to the preferred habitat. Regional lizards are predominately insectivorous, although all of them consume a variety of other invertebrates including snails, spiders, and millipedes, and large specimens of *Eumeces* occasionally eat young lizards and mice. Bay area snakes are all carnivorous, and the food varies greatly from species to species. Certain water snakes subsist almost exclusively on frogs and fish while the king snake, *Lampropeltis getulus*, frequently feeds on other reptiles including the copperhead, *Agkistrodon contortrix*. DDT is known to be especially dangerous to reptiles, especially those which feed on insects. (See also W74-00891) (Woodard-USGS) W74-00918

WATERFOWL OF THE CHESAPEAKE BAY, Bureau of Sport Fisheries and Wildlife, Jamestown, N. Dak. Northern Prairie Wildlife Research Center. R. E. Stewart.

WATER CYCLE—Field 02

Estuaries—Group 2L

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report Append C, Vol 2, p C-165-C-170, 1973, 22 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Waterfowl, Classification, Estuaries, Birds, Ducks (Wild), Geese (Wild), Aquatic life, Biology, Ecosystems, Ecology, Environmental effects, Water pollution effects, Reviews, Bibliographies.

Identifiers: *Waterfowl taxonomy.

Many species of bird, other than waterfowl, are characteristic inhabitants of regular occurrence on one or more habitats of Chesapeake Bay during appropriate seasons of the year. These total 75 species and represent 22 families: Gaviidae (loons), 2 sp.; Podicipedidae (Grebes), 3 sp.; Sulidae (Gannets), 1 sp.; Phalacrocoracidae (cormorants), 1 sp.; Ardeidae (herons), 9 sp.; Accipitridae (hawks and eagles), 3 sp.; Pandionidae (ospreys), 1 sp.; Falconidae (falcons), 2 sp.; Rallidae (Rails and coots), 7 sp.; Charadriidae (plovers and turnstones), 4 sp.; Scolopacidae (snipe, sandpipers, etc.), 13 sp.; Laridae (gulls and terns), 11 sp.; Tytonidae (barn owls), 1 sp.; Strigidae (typical owls), 1 sp.; Alcedinidae (Kingfishers), 1 sp.; Hirundinidae (swallows), 2 sp.; Corvidae (crows), 2 sp.; Troglodytidae (wrens), 2 sp.; Motacillidae (pipits), 1 sp.; Parulidae (wood warblers), 1 sp.; Icteridae (Blackbirds, etc.), 3 sp.; and Fringillidae (sparrows), 4 sp. For the majority of waterfowl, widgeongrass (*Ruppia maritima*) probably is the most important single food item. In many areas of Chesapeake Bay that were formerly important to waterfowl, the quality of habitat has deteriorated greatly during recent years mainly because of pollution and increasing turbidity. (See also W74-00891) (Woodard-USGS)

W74-00919

CURRENT STATUS OF THE KNOWLEDGE OF THE BIOLOGICAL EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS IN CHESAPEAKE BAY,
Maryland Univ., Prince Frederick. Hallowing Point Field Station.

J. A. Sherk, Jr.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-172-C-183, 1973, 47 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Sediment transport, *Sediments, Inflow, Streamflow, Erosion, Sedimentology, Ecosystem, Biology, Environmental effects, Turbidity, Bottom sediments, Suspension, Aquatic life, Reviews, Bibliographies.

Particulate material in the Chesapeake Bay can originate from organic/inorganic particles carried in by rivers, atmospheric fallout, biological activity, chemical reactions, resuspension from the bottom, disposal of wastes, and shore erosion. The particles carried in by rivers can be rock and mineral fragments such as quartz, feldspar, and mica (including clay) which serve as substrate for microorganisms and affect light transmission in the water column. In addition, organic matter fragments can make up about 26% (160,000 tons) of the total seston entering the Upper Bay from the Susquehanna River. The two major sources of suspended material to the Upper Bay are the Susquehanna River. The two major sources of suspended material to the Upper Bay are the Susquehanna River (670,000 tons/year) and shore erosion (100,000 tons/year). Most of the Susquehanna contribution for 1966 occurred during Spring runoff with about 90% of this material remaining in the northern Bay area. Particles suspended in the water column can impair light penetration and thus limit primary productivity by limiting the column of water in which light intensity is sufficient (about one percent of incident light) for the rate of photosynthesis to exceed respiration. Resuspended sediments exert an oxygen demand on the order of eight times that of the same

material in bottom deposits. (See also W74-00891) (Woodard-USGS)
W74-00920

CURRENT STATUS OF KNOWLEDGE CONCERNING THE CAUSE AND BIOLOGICAL EFFECTS OF EUTROPHICATION IN CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.

D. A. Flemer.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report Append C, Vol 2, p C-184-C-192, 1973, 28 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Eutrophication, *Water pollution effects, Nutrients, Nuisance algae, Biochemical oxygen demand, Estuaries, Reviews, Bibliographies.

The Chesapeake Bay is in serious future danger from nutrient enrichment. It could be the most intractable problem that management will face during the next few years. There are obviously limits to the solution of nutrient pollution by dilution, even for a large estuary. Major areas of phytoplankton standing crop and nutrient loading in Chesapeake Bay, especially N and P, have been identified. In addition, the tributaries of the upper Bay are rapidly showing signs of deterioration. The blue-green alga, *Anacystis* sp. has appeared as objectionable blooms since the summer of 1968 in the Elk River. There is a tendency for the blue-green pulses to appear earlier, last longer, and cover more area. Observations on the upper Patuxent estuary are interesting since winter concentrations of inorganic N and P often approach those reported for the upper Potomac and James subestuaries. Yet, nuisance blue-green algae have not overtaken the Patuxent to date. There is the possibility that the well developed marsh system in the upper Patuxent estuary serves as a natural tertiary treatment system. (See also W74-00891) (Woodard-USGS)
W74-00921

CURRENT STATUS OF KNOWLEDGE OF THE BIOLOGICAL EFFECTS OF HEAVY METALS IN THE CHESAPEAKE BAY,

Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.

J. M. Frazier.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report Append C, Vol 2, p C-193-C-201, 1973, 35 ref.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Heavy metals, Water pollution effects, Trace elements, Chemical wastes, Toxicity, Ecosystems, Bottom sediments, Aquatic life, Fish, Shellfish, Ecology, Mercury, Cadmium, Copper, Zinc, Reviews, Bibliographies.

Man's activities introduce heavy metals into the Chesapeake Bay system by many pathways, some of which are documented and others for which little information is available. The distribution, magnitude and characteristics of point sources such as industrial and domestic outfalls, dumping sites, and dredging projects have been investigated by the Environmental Protection Agency through the Annapolis Technical Laboratory, the Maryland Environmental Service, and the Virginia Institute of Marine Science (VIMS), but the heavy contributions of the more diffuse sources such as agricultural runoff, the flushing of urban areas during heavy rains, and the scrubbing out of air pollutants by precipitation and dry fallout are inadequately determined. The physical cycling of heavy metals in the system by means of dilution, current dispersion, turbulent diffusion, and sedimentation are fairly well understood; however, the chemical cycling through such processes as absorption, ion exchange, complex formation, chela-

tion, flocculation, and coprecipitation have been poorly studied. There exist some data on the levels of heavy metals in marine organisms of the Chesapeake Bay. The Hg in blue crab, *Callinectes sapidus*, oysters, *Crasostrea virginica*, eels, *Anchovia rostrata*, white perch, *Morone americana*, catfish, *Ictalurus* spp. and striped bass, *Morone saxatilis*, has been measured, levels of which never exceeded the FDA standards of 0.5 ppm. (See also W74-00891) (Woodard-USGS)
W74-00922

CURRENT STATUS OF RESEARCH ON THE BIOLOGICAL EFFECTS OF PESTICIDES IN CHESAPEAKE BAY,
Westinghouse Ocean Research Lab., Annapolis, Md.

T. O. Munson, and R. J. Huggett.

In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, Append C, Vol 2, p C-202-C-205, 1973.

Descriptors: *Chesapeake Bay, *Water resources development, *Biota, *Pesticides, *Water pollution effects, Water pollution sources, DDT, Toxicity, Fish, Biology, Ecosystems, Ecology, Sediments, Shellfish, Anadromous fish, Estuaries, Reviews.

Very little is known about the biological effects of pesticides in the Chesapeake Bay. Although some information is available from laboratory studies about the short and long-term toxicities of certain persistent pesticides relative to some of the species found in the Bay, only in a few isolated cases have mortalities observed in the field been known to be directly attributable to pesticides. During a program to examine the role of an anadromous fish, the alewife, in pesticide transport, samples from the Potomac, James, and Rappahannock Rivers were analyzed. Apparently the alewives picked up pesticides on their journey up the Bay, because the ones taken in the rivers had much higher pesticide levels than the ones taken from the ocean at the mouth of the Bay. During the period 1965-1970, 88 oyster samples collected by the Maryland State Department of Natural Resources were analyzed by the State Department of Mental Health and Hygiene. Of the 81% of the samples which contained DDT residues, most fell in the 0.011 to 0.011 ppm range, with the highest value being 0.070 ppm. (See also W74-00891) (Woodard-USGS)
W74-00923

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX D—MAP FOLIO.
Corps of Engineers, Baltimore, Md.

1973, 53 P.

Descriptors: *Chesapeake Bay, *Water resources development, *Land resources, *Land use, *Maps, Shores, Geology, Geomorphology, Contours, Altitude, Sediments, Topography, Water resources, Water supply, Recreation facilities, Electric powerplants, Beach erosion, Navigation, Projects, Aquatic plants, Eutrophication, Sport fishing, Commercial fishing, Wetlands, Wildlife, Water pollution.

Appendix D, a map folio of the Chesapeake Bay Existing Conditions Report, has been structured to provide the reader with a visual information supplement to Appendices B and C. Composed of plates which are too large to appear in the appendices themselves, Appendix D presents a visible recognition of project locations and problem areas associated with data presented in the other appendices. The plates refer to such data as land use, groundwater, water supply, recreation, power, beach erosion, navigation, noxious weeds, and fish and wildlife. It is also intended that through comparison of these plates some of the conflicts in water resource development around the Bay area

Field 02—WATER CYCLE

Group 2L—Estuaries

will be delineated. A list of the specific plates is indexed for easy reader orientation. Plates are numbered in relationship to the individual appendix and specific chapter with which they are associated. (See also W74-00887 thru W74-00891) (Woodard-USGS)
W74-00924

DYNAMIC WATER QUALITY FORECASTING AND MANAGEMENT,
Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W74-00927

OCEAN WASTE DISPOSAL IN SELECTED GEOGRAPHIC AREAS.
Interstate Electronics Corp., Anaheim, Calif. Oceanics Div.
For primary bibliographic entry see Field 05E.
W74-00928

TROPHIC STRUCTURE AND BIOACTIVITY OF THE PLANKTON COMMUNITIES IN LOWER REACH OF ELBE ESTUARY: CRITERIA FOR SAPROBIC CLASSIFICATION OF A TIDAL WATER (IN GERMAN),
For primary bibliographic entry see Field 05C.
W74-01003

CIRCULATION IN THE BAY OF AMPASINDAVA (MADAGASCAR) AND ITS BIOCHEMICAL IMPLICATIONS (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 05B.
W74-01005

SILICATE IN THE WATER OF THE BAY OF VIGO (IN SPANISH),
Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.
M. Lopez-Benito.
Invest Pesq. Vol 36, No 2, p 273-282, 1972, Illus, English summary.
Identifiers: Bays, Seasonal, *Silicates, *Spain (Vigo Bay).

A study was made of the silicate distribution during 1970, in a station of the Ria Vigo, Spain. A higher silicate concentration was observed in the area of Rande and the inlet of San Simon. In station 3, low values of silicate occurred from Feb. to April (2.5-4 micro M SiO₂/l). From May to Aug. the values remained between 5 and 8 micro M SiO₂/l. In Sept. and Oct. the values decreased again to 1.66 micro M SiO₂/l. Finally, a sudden increase was observed (14-14.26 micro M SiO₂/l) in Nov. and Dec.—Copyright 1973, Biological Abstracts, Inc.
W74-01007

CHANGES OF PLANT COMMUNITIES IN OVERTURNED BODIES OF WATER OF THE AMU-DARYA DELTA, (IN RUSSIAN),
M. T. Tadzhidinov, and K. N. Butov.
Ekologiya. Vol 3, No 2, p 64-68, 1972.
Identifiers: *Deltas, *Phragmites-Communis, Plant communities, *USSR (Amu-Darya delta), Willow.

The effect of change in the water regime on overgrowth of the Aralsk (USSR) basin is reported. The dominating factor or factors which contribute to this ecological problem is the formation of superficial young cane or reed (*Phragmites communis* Trin.) which can withstand temporary drowning and debris from the river. The willow also plays an important role; they can be found all

over the delta, and with the cane and a number of other plants, they contribute to the overgrowth of the waterways. The movement of the sea and its shore also contribute to the problem. A stepwise discussion of the various contributing factors such as depth of water and the name of the various plants is presented.—Copyright 1973, Biological Abstracts, Inc.
W74-01018

LOUISIANA GOVERNMENT AND THE COASTAL ZONE-1972.
For primary bibliographic entry see Field 06E.
W74-01028

WETLANDS '73: TOWARD COASTAL ZONE MANAGEMENT IN LOUISIANA.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.

Annual report. March, 1973. 7 p, 4 append.

Descriptors: *Planning, *Coastal marshes, *Environmental effects, Wetlands, Ecosystems, Land use, Financing, Salinity, Erosion, Administration, Institutions, *Louisiana.
Identifiers: *Coastal zone management, Coastal Zone Management Act, Public participation, Federal assistance.

The Louisiana Advisory Commission on Coastal and Marine Resources is charged with developing a long term plan for the orderly development and management of the coastal zone. This task is becoming increasingly important because of the recent passage of the federal Coastal Zone Management Act which provides assistance for state management efforts and because Louisiana citizens are now showing great concern over several proposed projects in coastal zone areas. The report recommends that the state take full advantage of the federal act by providing funds to continue state planning efforts and that the state become a leader in coastal zone management programs. Discussed briefly are four elements of a coastal zone management program: (1) representation of diverse interest groups; (2) citizen involvement; (3) utilization of the best available scientific and technical assistance; and (4) intensive study and analysis of the coastal zone problems and opportunities. Some of the planning and management concepts and principles to be included in the programs are the delineation of environmental management units, the use of ecosystem approaches to analyze the natural processes involved, the restriction of certain land uses, the use of various control structures to prevent erosion and salt water intrusion, and the possible diversion of fresh water into the coastal areas to control salinity. (Elfers-North Carolina)
W74-00876

Available from the National Technical Information Service as EIS-AA-73-02 66-F \$7.00 in paper copy, \$1.45 in microfiche. February 12, 1973. 84 p, 1 append.

Descriptors: *Environmental effects, *Desalination, *Saline water, *Water resources development, Desalination, Water pollution sources, Water quality control, Economics, Water properties, Irrigation water, Water quality, Legislation, Use of water, Alternative water use, Competing use, Quality control, Federal government. Identifiers: *Environmental Impact Statements.

This environmental impact statement concerns the five-year extension of research and development projects and programs to improve desalting technology in accordance with Public Law 92-60 (PL 92-60). The research and development projects and programs that will be carried out under PL 92-60 are not expected to affect the environment significantly. Operations at the test facilities have been reassessed and found to have no significant environmental effects. Facilities are monitored on a continuing basis to assess and to minimize environmental impact. Alternatives considered include surface water development, groundwater development, improved water management practices, weather modification to increase precipitation, and recycling of sewage treatment and industrial plant effluents to industrial, agricultural, and municipal uses. This five-year extension of the Saline Water Conversion Program will provide for the development and demonstration of practical means to convert saline water and other chemically contaminated water to a quality suitable for municipal, industrial, agricultural, and other beneficial uses. (Mockler-Florida)
W74-00876

A SUMMARY REPORT MASTER WATER AND SEWERAGE PLAN.
CIM, Inc., San Luis Obispo, Calif.
For primary bibliographic entry see Field 05D.
W74-01041

SALINE WATER CONVERSION RESEARCH, 1972 ANNUAL REPORT.
California Univ., Berkeley. Sea Water Conservation Lab.

University of California Water Resources Center Desalination Report No. 52. March 1973. 99 p.

Descriptors: *Desalination, Desalination apparatus, *California, Ion exchange, Membrane processes, Distillation, Alternative water use.

Progress made in desalination and sea water conversion research conducted at the Sea Water Conversion Laboratory of the University of California, at Richmond, California is reported. Progress reports are included on several basic desalination approaches including development of new methodology and an evaluation of alternative techniques, distillation studies, ion exchange studies, and membrane processes. Both State of California and Federally funded research activities are described. (Snyder-California)
W74-01049

SALINE WATER RESEARCH, PROGRESS SUMMARY, JANUARY 1, 1972 - DECEMBER 31, 1972.
California Univ., Los Angeles. School of Engineering and Applied Science.

University of California Water Resources Center Desalination Report No. 53, January 1973, 67 p.

Descriptors: *Desalination, Desalination apparatus, *California, *Demineratization, Corrosion control, Semipermeable membranes, Mass transfer, Scaling, Heat transfer, Electrolytes.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Water Yield Improvement—Group 3B

Progress made in desalination research conducted at the School of Engineering and Applied Science of the University of California at Los Angeles is reported. Progress reports on demineralization studies using semipermeable membranes, mass transport of electrolytes in membranes, scale control studies, heat and mass transfer studies, and corrosion studies are included. (Snyder-California) W74-01050

3B. Water Yield Improvement

SAMPLING REQUIREMENTS FOR AREAL WATER EQUIVALENT ESTIMATES IN FORESTED SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. C. F. Leaf, and J. L. Kovner. Water Resources Research, Vol 8, No 3, p 713-716, 1972. 2 fig, 1 tab, 11 ref.

Descriptors: Coniferous forests, Mountain forests, Snow cover, Snow management, Snow surveys, Snowfall, Snowmelt, Snowpacks, *Water equivalent, Water yield, *Watershed management, *Colorado, *Forest watersheds. Identifiers: *Snowpack sampling, Snow storage, *Subalpine watersheds.

Statistical analyses were made of the snow course measurements on a 714-acre forested subalpine watershed in central Colorado where melt rarely occurs during the winter snow accumulation season. The following guidelines were developed for sampling mountain snowpacks on an areal basis: (1) sampling zones should be stratified by elevation, the sampling in each zone being proportional, and (2) sampling points should be widely spaced over each zone, two duplicate measurements at most being made at a location. (Forest Service) W74-00675

ANNUAL STREAMFLOW SUMMARIES FROM FOUR SUBALPINE WATERSHEDS IN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. C. F. Leaf, and G. E. Brink. USDA Forest Service General Technical Report RM-1, 1972. 24 p.

Descriptors: *Colorado River Basin, Coniferous forests, *Demonstration watersheds, *Runoff, Snowmelt, Stream gages, *Streamflow, Surface waters, Hydrologic data. Identifiers: Fraser Experimental Forest, *Subalpine watersheds.

Streamflow runoff summaries are presented for four experimental watersheds near Fraser and Steamboat Springs, Colorado. Interval of published record varies from 1943-71 at Fraser to 1967-71 at Steamboat Springs. (Forest Service) W74-00676

WATER YIELD CHARACTERISTICS OF THREE SMALL WATERSHEDS IN THE NORTHEASTERN BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. H. K. Orr, and T. VanderHeide. USDA, Forest Service Research Paper RM-100, February 1973. 8 p, 6 fig, 3 tab, 3 ref.

Descriptors: *Precipitation, *Water yield, Hydrology, *Watershed management, Evapotranspiration, Water yield improvement, Hydrogeology, Coniferous forests, Mountain forests, National Forests. Identifiers: *Ponderosa pine forest, *Black Hills, Mountain watersheds.

Three small forested watersheds (217, 89, and 190 acres) on a laccolith in the northeastern Black Hills have yielded surface runoff equivalent to 7.12, 7.57, and 6.51 inches or 25, 27, and 23 percent of average annual precipitation, water years 1964-69 inclusive. Losses, assumed near the equivalent of evapotranspiration (stream gages are tightly sealed on bedrock) have averaged 21.1, 20.3, and 21.6 inches respectively. The greatest loss has occurred from the watershed having the greatest volume of timber per acre, the deepest soil, and the gentlest gradient. Timber is presently being harvested on one watershed for evaluation of the effects of such treatment on water yield and quality. (Forest Service) W74-00677

SIMULATING EFFECTS OF HARVEST CUTTING ON SNOWMELT IN COLORADO SUBALPINE FOREST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 04C. W74-00686

THE EFFECT OF OVERSTORY REMOVAL UPON SURFACE WIND IN A BLACK SPRUCE BOG,

Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station. J. M. Brown. USDA Forest Service Research Note NC-137, 1972. 2 p, 1 fig, 1 tab, 4 ref.

Descriptors: *Winds, *Meteorology, Microenvironment, *Watershed management, *Wetlands, Clear-cutting, Coniferous forests, Energy transfer, Evapotranspiration, Advection, *Minnesota, Bogs, Demonstration watersheds. Identifiers: *Black Spruce canopy, Strip-cutting.

Wind passage was measured over a black spruce canopy, at the surface under the canopy, and in a clearcut strip in a northern Minnesota bog. During a 40-day period wind below the canopy was 10 percent of that above the canopy while the wind in the clearcut strip was 45 percent of the total above the canopy. Wind at the surface of the clearcut strip was of longer duration and greater velocity than under the black spruce canopy. (Forest Service) W74-00688

EFFECT OF SNOW FENCE HEIGHT ON WIND SPEED,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. R. D. Tabler, and D. L. Veal. Bulletin of the International Association of Scientific Hydrology, Vol XVI, No 4, p 49-56, December 1971. 5 fig, 1 tab, 7 ref.

Descriptors: Winds, *Windbreaks, *Wind velocity, *Shelterbelts, Snow cover, Blizzards, Snow management, Snowpacks, Watershed management.

Identifiers: *Snow fences, Snow drifting, Snow transport, Snow deposition, Blowing snow, Induced snow accumulation, *Snowdrifts.

Wind speeds were measured to windward and to leeward of vertical-slat snow fences 6, 8, 10, 12, and 16 ft tall. The down-wind measurements were made at distances of 2.5H, 5H, and 10H from the fence, where H is fence height. Speed measurements at various heights were integrated up to the height of the fence, and the percentage reduction in wind speed was calculated. Results indicated that total wind speed reduction was proportional to the 1.5 power of fence height. (Forest Service) W74-00691

SOIL WATER DEPLETION BY A HARDWOOD FOREST IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station. R. S. Sartz.

Soil Science Society of American Proceedings, Vol 36, No 6, p 961-964, 1972. 4 fig, 2 tab, 11 ref.

Descriptors: *Water yield improvement, *Vegetation effects, *Watershed management, Water balance, Clearcutting, Forest soils, Soil water, Field capacity, Soil water movement, *Wisconsin. Identifiers: *Soil water depletion, *Hardwood forests.

Soil water depletion by cut and uncut forest on a north slope was measured for 3 years with a neutron meter. Depletion by the uncut forest began early in the growing season at all depths measured and continued at a nearly constant rate until leaf fall. Seasonal depletion in a 1.5 m soil mantle averaged 188 mm on uncut plots, 87 mm on clearcut plots, and 57 mm on plots without vegetation. The amount of depletion increased with mantle depth; thus cutting had a greater water-saving effect on deeper soils. Estimates of evapotranspiration by uncut forest agreed closely with empirical estimates of potential evapotranspiration. (Forest Service) W74-00693

DESIGN OF A WATERSHED SNOW FENCE SYSTEM, AND FIRST-YEAR SNOW ACCUMULATIONS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. R. D. Tabler.

In: Western Snow Conference, Billings, Montana, April 1971 Proceedings. Vol 39, p 50-55. 7 fig, 2 ref.

Descriptors: *Snow management, *Snowpacks, *Water yield improvement, *Windbreaks, Snow cover, Water yield, Watershed management, Streamflow, Snowmelt, Water conservation, Shelterbelts, Blizzards, Winds, Water sources, Water equivalent, Water balance, Snowfall, Water storage, *Wyoming. Identifiers: *Snow fences, Induced snow accumulation, Blowing snow, Snow transport, *Snow-drifts.

Inducing snow accumulation with fences in areas with insufficient natural barriers can materially increase total snow storage by reducing sublimative losses of wind-blown snow. A method has been developed to estimate the amount of blowing snow available at a snow fence site, whereby sublimation loss is considered to be a linear function of transport distance. Using this approach to determine the optimum capacity of the fence system, a 12 1/2-ft-tall fence, 1300 ft long, was built on a 111-acre watershed in 1969. The first winter after building the fence, peak snowpack water-equivalent was increased about 70%. Predicted snowpack water-equivalent was 1.0 area-inch, while the actual was 1.7 area-inches—an increase of about 6.5 ac-ft. If the snow fence continues to maintain total snow storage about 7 ac-ft per year above 'normal' over the anticipated 25-year project life, the value of the additional stored water-equivalent would have to be about \$37 per ac-ft to amortize the initial \$6500 construction cost. (Forest Service) W74-00695

PHOTOGRAMMETRIC DETERMINATIONS OF SNOW COVER EXTENT FROM UNCONTROLLED AERIAL PHOTOGRAPHS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. A. D. Haeffner, and A. H. Barnes. American Society of Photogrammetry Tech. Sess. Proc., p 319-340. 1972. 7 fig, 4 tab, 13 ref.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B—Water Yield Improvement

Descriptors: *Photogrammetry, *Remote sensing, *Aerial photography, *Snow cover, Rocky Mountain Region, *Colorado, Snow surveys, Streamflow forecasting, Hydrology, Small Watersheds. Identifiers: *Rocky Mountains, Fraser Experimental Forest.

Efficient operation of water projects depends on the accuracy of streamflow forecasts. The accuracy of forecasts of snowmelt contribution to streamflow is improved if precise estimates of the areal extent of snow cover are available. A simple photogrammetric technique for determining the areal extent of snow cover from uncontrolled aerial photographs in mountainous terrain is described. A Wild STK-1 Stereocomparator with an attached digital card punch was used to delineate the snow areas and record the data. Since ground control was not available, only relative ground coordinates of the delineated areas could be computed from the parallax equation for overlapping vertical photographs. From these relative coordinates, a true snow cover percentage for the selected area was computed. Analysis of the technique revealed some operator judgment was required in deciding which snow patches to include and/or how detailed to delineate them. A maximum deviation of less than 4 percent of the mean resulted from the operator making repeated measurements on each of several stereo models containing snow cover ranging from 93 to 27 percent. (Forest Service)

W74-00697

SOILS AND WATER,
Forest Service (USDA), Asheville, N.C.
Southeastern Forest Experiment Station.
W. T. Swank.

In: 11th Auburn Forestry Forum Proc. 1972. p 51-58, December 1972. 3 fig, 9 ref.

Descriptors: *Clearcutting, *Vegetation effects, *Watershed management, *Water yield improvement, Timing, *North Carolina, Water resources development, Hardwood, Demonstration watersheds. Identifiers: *Appalachian Highlands.

A summary is presented of existing information on the effects of clearcutting forests on the quantity, quality, and timing of streamflow in the Appalachian Highlands. The statement was presented at a public hearing on applications and objections to clearcutting. (Forest Service)

W74-00698

3C. Use of Water of Impaired Quality

EL PASO'S WATER RESOURCES,
El Paso Water Utilities, Tex.
For primary bibliographic entry see Field 06D.
W74-00740

FACTORS OF CHEMICAL FERTILIZATION IN SALINE WATER IRRIGATION: A REVIEW,
Negev Inst. for Arid Zone Research, Beersheba (Israel). Dept. of Plant Introduction and Ecology. M. Twersky.
Dec. 1971. 35 p, 151 ref.

Descriptors: *Saline water, *Irrigation water, *Crop response, *Agricultural chemicals, Ions, *Bibliographies, Fertilizers, Brackish water, Salt tolerance, Nutrients, Soil profiles.

The object is to focus significant points in current literature on problems of increasing plant production in arid and semi-arid areas with fertilizer practices and the increasing use of brackish water sources in combination with other marginal inputs. Development of irrigation agriculture in such regions and the shortage of good quality water for irri-

gation has turned many planners to consider the use of saline water in irrigation technology. The response of crop production to brackish water irrigation cannot be separated from that of nutrient fertilization. Improved response of plants to fertilization depends greatly upon water management systems. The following points are discussed: Characteristics and management of water quality, Effect of saline water and fertilizers on physiochemical reactions in the soil profile, Crop response to fertilizer nutrients and salt tolerance, and the Application of predictive models. The advantage of analytical models for calculating these interactions is emphasized. (Paylore-Arizona)

W74-00757

CHEMICAL AND BIOLOGICAL PATTERNS IN THE LOWER COLORADO RIVER SYSTEM, Arizona Univ., Tucson.

For primary bibliographic entry see Field 05C.
W74-00760

ECONOMIC FEASIBILITY OF AN INTEGRATED COTTONWOOD PLANTATION UTILIZING A NUCLEAR POWER REACTOR, Battelle-Pacific Northwest Labs., Teheran (Iran).

B. W. Cone.
Journal of Forestry, Vol 70, No 10, p 620-623, Oct 1972. 1 illus, 2 tab, 4 ref.

Descriptors: *Irrigation, *Water utilization, *Forest management, *Crop production, *Cooling water, *Nuclear reactors, Nuclear power plants, Hardwoods, Economic feasibility, Water types, Irrigated land, Water reuse.

Identifiers: *Cottonwood (or *Populus deltoides*), Wood, Chips.

The irrigation of cottonwood (*Populus deltoides*) plantations with cooling water from a nuclear power generator was evaluated financially. It was found to offer sufficient profit incentives for the establishment of experimental test plots designed to estimate crop yields resulting under different spray regimes and applied water volumes. A cottonwood plantation could become a self-paying complementary enterprise for a nuclear power station if it were to yield 1300 cu ft per acre of marketable wood chips. (Witt-IPC)

W74-00771

WATER REUSE IN INDUSTRY, PART 2 -- TRANSPORT WATER, Pavia-Byrne Engineering Corp., New Orleans, La.

For primary bibliographic entry see Field 05D.
W74-00759

EFFECT OF DETERGENT APPLICATION ON THE GROWTH OF CORN,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
J. N. Judy, D. C. Martens, and W. Kroontje.
Journal of Environmental Quality, Vol 2, No 2, p 310-314, April-June 1973. 7 tab, 1 fig, 18 ref.
OWRR-A-041-VA (2).

Descriptors: *Detergents, Waste disposal, *Phosphorus, Boron, Sodium chloride, *Clay loam, Statistical methods, Sands, *Virginia, *Corn (Field), Enzymes, Soils, Water reuse.

Identifiers: *Sandy loam, Soil pH, Statistical analysis, Norfolk soil, Davidson soil.

A greenhouse experiment was conducted to determine the effects of two detergents on the growth of corn (*Zea mays L.*) on Davidson clay loam and Norfolk fine sandy loam. A heavy-duty non-enzyme detergent (Bz) and a heavy-duty enzyme detergent (Tx) were applied to the soils in watering solutions at concentrations of 0, 20, 800, 1600, 4800, 8000, 10,000, 12,000, and 14,000 ppm. Stimulations in growth occurred on the Davidson soil that received the 1600 ppm Bz or the 800, 1600,

4800, and 8000 ppm Tx solutions and on the Norfolk soil that received the 800 ppm Tx solution. These stimulations were attributed to responses to P contained in the detergents. Yield decreases occurred on the Dat received solutions containing 8000 through 14,000 ppm Bz or 14,000 ppm Tx, and on the Norfolk soil that received solutions containing 1600 through 14,000 ppm Bz or 4800 through 14,000 ppm Tx. These yield decreases were attributed to soluble salt damage from the Na salts contained in the detergents on all treatments, except where Tx was applied to the Norfolk soil. In the latter case, specific Na salt effects could not be separated from general salinity effects. Plants grown on the Davidson soil were more tolerant to detergent applications than those grown on the Norfolk soil, probably because of the greater salt retention of the former soil. It was concluded that the changes in soil pH and B availability due to detergent applications were not responsible for the yield decreases in this study.

W74-01057

3D. Conservation in Domestic and Municipal Use

SUBURBAN AMERICA: POPULATION DYNAMICS AS RELATED TO WATER RESOURCES PLANNING, Wapora, Inc., Washington, D.C.

For primary bibliographic entry see Field 06B.
W74-00553

THE WATER BUDGET AND WASTE TREATMENT AT A MODERN DAIRY, Mississippi State Univ., State College. Water Resources Research Inst.

For primary bibliographic entry see Field 05D.
W74-00560

SHORELINE MANAGEMENT INVENTORY, Renton Planning Dep., Wash.

For primary bibliographic entry see Field 04A.
W74-00741

POLICY PLAN FOR DEVELOPMENT OF LANSING'S WATERFRONT, Waterfront Development Board, Lansing, Mich.

April, 1973. 15 p.

Descriptors: *Planning, *Environmental effects, *Michigan, Water resources development, Urbanization, Natural resources, Land use, Social aspects, Administration, Economic impact.

Identifiers: Waterfronts, *Waterfront development, *Policy plan, *Lansing (Mich.).

This report is Part III of the 'Plan for Development of Lansing's Waterfront'. Part I covers background including past and present waterfront proposals; Part II presents the analysis of trends, problems, and potentials for waterfront development. Recommendations based on the first two reports are presented in the form of goals, policies, and actions related to seven specific components of development: natural features, land use, transportation, economy, social issues, health issues, and governing bodies. The basic goals of the policy plan are to make the city a better place to live, to improve the image of the waterfront, to promote people oriented land uses on the waterfront and to encourage cooperation among adjacent units of government. Some of the policies include the encouragement of public access to the waterfront, the provision of waterfront areas for use by diverse groups of people, the provision of recreation and amenity potentials, the cooperation with business and landowners to promote sound development, and the education of the public on the nature of waterfront areas. (Elfers-North Carolina)
W74-00742

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Industry—Group 3E

PROTECTING OUR WATER ENVIRONMENT.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 05G.
W74-00743

**REPORT TO THE GOVERNOR AND THE
LEGISLATIVE COMMISSION: POLLUTION
ABATEMENT PROJECT, LAS VEGAS WASH
AND BAY.**
Las Vegas Valley Water District, Nev.
For primary bibliographic entry see Field 05D.
W74-00744

SEWER SYSTEM COST ESTIMATION MODEL.
Voorhees (Alan M.) and Associates, Inc.,
McLean, Va.
For primary bibliographic entry see Field 05D.
W74-00745

A REPORT UPON WEST CENTRAL MARICOPA COUNTY, ARIZONA: VOLUME I, A STUDY OF PHYSICAL ENVIRONMENTAL FACTORS AS A BASIS FOR LAND USE PLANNING.
Maricopa County Planning and Zoning Dept.,
Phoenix, Ariz.

October, 1971. 53 p, 11 fig, 4 tab, 46 ref, 3 append.

Descriptors: *Planning, Water resources development, Geology, Physiographic provinces, Topography, Soils, Drainage, Floodplains, Irrigation, Groundwater, *Arizona, Subsidence, Hydrogeology, Urbanization.

Identifiers: *Environmental inventory, Salt River (Ariz), *Maricopa County (Ariz).

Environmental conditions in the study area, a 342 square mile area immediately west of Phoenix, are not unique insofar as the whole Salt River Valley is concerned. Factors evaluated include geology, physiographic processes, topography, soils, drainage, floodplains, hydrogeology, subsidence due to groundwater withdrawal, irrigation, groundwater recharge, potential water sources, and water quality. Limitations to development result from drainage, water supply, and wastewater disposal. Waste usage is estimated at 556,200 acre-feet annually. The area's 50,000 people use only 11,200 acre-feet, while the remainder is consumed by irrigation. Average annual water input is only 326,900 acre-feet. The deficiency of water is obtained by depleting groundwater reserves. At present depletion rates groundwater will be exhausted by 2010. Two possible potential sources of water are the Central Arizona Project, which could provide 35,000-100,000 acre-feet annually and intensive use of wastewater effluents, which could provide 80,000-150,000 acre-feet. Water from any new sources will need more treatment than water now used, but treatment is said to be within reasonable economic limits. Maps, tables, and charts supplement the text. Land use planning based on this evaluation is discussed in Volume II. (Stein-North Carolina)

W74-00746

**SOLID WASTE MANAGEMENT PLAN,
COWLITZ AND WAHKIAKUM REGION.**
Cowlitz, Wahkiakum Regional Planning Commission, Kelso, Wash.
For primary bibliographic entry see Field 05D.
W74-00747

RECONNAISSANCE ANALYSIS OF EFFECTS OF WASTE-WATER DISCHARGE ON THE SHALLOW GROUND-WATER FLOW SYSTEM, LOWER LAS VEGAS VALLEY, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 05B.
W74-00748

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1972.

Honolulu Board of Water Supply, Hawaii.
For primary bibliographic entry see Field 06B.
W74-00749

LAMAR COUNTY: LAND USE SURVEY AND ANALYSIS, LAND USE PLAN, HOUSING, WATER AND SEWER, OPEN SPACE.
West Alabama Planning and Development Council, Tuscaloosa.
For primary bibliographic entry see Field 05D.
W74-00750

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 05D.
W74-00753

PRESENT AND FUTURE WATER USE AND ITS EFFECT ON PLANNING IN MARICOPA COUNTY, ARIZONA,

H. J. Thiele.
Prepared in cooperation with Maricopa County Planning and Zoning Department, Phoenix, Arizona. September, 1965. 59 p, 20 fig, 28 tab, 41 ref.

Descriptors: *Planning, *Water demand, *Water supply, *Forecasting, *Arizona, Groundwater mining, Water resources, Irrigation, Hydrogeology.

Identifiers: *Maricopa County (Ariz), Salinization, Phoenix (Ariz), Salt River (Ariz).

Because land use plans should consider water resources and their ability to serve a basin area, water supply and need in the metropolitan Phoenix portion of Maricopa County are analyzed. Three basic components of the study were a wateruse study, a water-resources study, and a water-utilization-potential study. Horizons for projections were 1980 and beyond. In 1963 almost 3 million acre feet of water were used annually in the metropolitan area, 88% being used for irrigation at an average rate of 4.84 acre-feet per acre of land annually. Over 100,000,000 acre-feet of groundwater lay beneath Phoenix but 1.3% was depleted that year. Consumptive use of 2.2 million acre-feet added 1.8 million tons of salt to underground reserves. Continued population increases in Phoenix are accompanied by declining potential for irrigating land. Water need decreases as irrigated land leaves productivity. Groundwater reserves decrease, however, until 2020 when use of the remaining 39 million acre-feet should be frozen until emergency needs dictate. The report forecasts 1.8 million people in the Phoenix area in 1980 and 3.2 million ultimately. Water demand at delivery points in 1980 will be 2.2 million acre-feet, less than in 1963, while ultimate demand at delivery points will be 1.8 million acre-feet, assuming no irrigation. It is estimated that the Salt River Project, Central Arizona Project, and reuse of treated effluent will be able to meet water demands indefinitely. Maps, charts and tables supplement the text. (Stein-North Carolina)

W74-00754

SUBJECTIVE DECISION-MAKING FOR URBAN WATER RESOURCES DEVELOPMENT,

Rockwell International Corp., Anaheim, Calif.
For primary bibliographic entry see Field 06B.
W74-00884

STORM DRAINAGE STUDY, (CHATHAM COUNTY-SAVANNAH, GEORGIA).
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

For primary bibliographic entry see Field 04A.
W74-01031

(THE POTOMAC 1972).
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 06B.
W74-01032

WATER AND SEWER SERVICE NEEDS OF LOW AND MODERATE INCOME HOUSEHOLDS IN METROPOLITAN WASHINGTON.

Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W74-01034

ENVIRONMENTAL IMPACT STUDY FOR EXPANSION ON THE VILLAGE CREEK SEWAGE TREATMENT PLANT,
Advanced Technology Center, Inc., Dallas, Tex.
For primary bibliographic entry see Field 05D.
W74-01035

MASTER PLAN FOR MAJOR DRAINAGE: HENRY'S LAKE AREA, SUBBASIN 1-31-55-01.

Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 06B.
W74-01037

A PROGRAM FOR STORM DRAINAGE AND FLOOD CONTROL-1971-1990: DAMAGE PREVENTION, MAJOR DRAINAGEWAYS, MASTER PLANNING, REGIONAL MANAGEMENT.

Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 06F.
W74-01038

ANALYSIS OF PORT DEVELOPMENT POTENTIALS AT GREAT SODUS BAY.
Genesee/Finger Lakes Regional Planning Board, Rochester, N.Y.
For primary bibliographic entry see Field 06B.
W74-01039

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART I NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 06D.
W74-01040

AREAWIDE WATER AND WASTE WATER PLANNING STUDY FOR THE ST. CHARLES MESA, RYE-COLORADO CITY, AND BEULAH SECTORS OF PUEBLO COUNTY.

Sellards and Grigg, Inc., Lakewood, Colo.
For primary bibliographic entry see Field 05D.
W74-01047

WATER-RELATED FACILITIES STUDY FOR THE COMPREHENSIVE REGIONAL PLAN OF COLUMBUS AND FRANKLIN COUNTY (OHIO).

Burgess and Niple, Ltd., Columbus, Ohio.
For primary bibliographic entry see Field 06B.
W74-01048

3E. Conservation in Industry

POWER PLANT COOLING SYSTEM STILL USING SEWAGE EFFLUENT.
Zia Co., Los Alamos, N. Mex.
For primary bibliographic entry see Field 05D.
W74-00778

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E—Conservation in Industry

IMPROVING WATER ECONOMY OF A NORTHERN KRAFT BLEACH PLANT,
B. E. Werenkiold.
Paper Trade Journal, Vol 156, No 42, p 43-45, Oct 9, 1972. 4 fig.

Descriptors: *Water consumption, *Industrial water, *Pulp and paper industry, Temperature, Freshwater, Water types, Systems analysis, United States, Steam.
Identifiers: Kraft mills.

A systems engineering study of an integrated bleached kraft pulp, paper, and board mill in a northern U.S. location is reported. Its aim was to reduce water consumption under widely varying fluctuations in freshwater temperature. The mill's water input between the high-density brown-stock storage and the bleach plant thickener varied originally between 44,000 and 63,000 gal/ton of bleached pulp. The process changes adopted as a result of this study reduced this to less than 15,200 gal/ton. Further recommendations are made, aiming at a target input of 10,000 gal, with corresponding savings in direct steam demand of about 2,100,000 Btu/ton. (Witt-IPC)
W74-00792

WATER REUSE IN INDUSTRY, PART 1 -- POWER GENERATION,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W74-00794

WATER REUSE IN INDUSTRY, PART 2 -- TRANSPORT WATER,
Pavia-Byrne Engineering Corp., New Orleans, La.
For primary bibliographic entry see Field 05D.
W74-00795

WATER REUSE IN INDUSTRY, PART 3 -- MINE WATER,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W74-00796

WATER REUSE IN INDUSTRY, PART 4 -- METAL FINISHING,
Avco Corp., Wilmington, Mass. Avco Space Systems Div.
For primary bibliographic entry see Field 05D.
W74-00797

WATER REUSE IN INDUSTRY, PART 5 -- THE WATER POLLUTION CONTROL ACT: REACHING TOWARD ZERO DISCHARGE,
Polytechnic Inst. of Brooklyn, N.Y.
For primary bibliographic entry see Field 05D.
W74-00798

3F. Conservation in Agriculture

ESTABLISHING THE IMPACT OF AGRICULTURAL PRACTICES ON GROUNDWATER QUALITY,
Minnesota Univ., Minneapolis. Dept. of Soil.
For primary bibliographic entry see Field 05B.
W74-00571

SPRAY DISPOSAL OF SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W74-00572

WHEAT RESPONSE TO SOIL MOISTURE AND THE OPTIMAL IRRIGATION POLICY UNDER CONDITIONS OF UNSTABLE RAINFALL,
Hebrew Univ., Jerusalem (Israel).

D. Yaron, G. Strateener, D. Shimshi, and M. Weisbrod.
Water Resources Research, Vol 9, No 5, p 1145-1154, October 1973. 2 fig, 6 tab, 17 ref.

Descriptors: *Irrigation efficiency, *Soil moisture, *Rainfall, *Stochastic processes, *Simulation analysis, *Decision making, *Optimum development plans, Computer models, Estimating, Irrigation practices, Crops, Water management (Applied), Systems analysis, Risks.
Identifiers: *Wheat yield, Irrigation policy.

Presented is a method for estimating a response function of wheat yield to soil moisture and for determining the optimal irrigation policy under conditions of stochastic rainfall. To determine such policy, information on the variation of the soil moisture over time as a function of depth is needed: A low-cost, computer simulation, soil moisture estimation model designed to reconstruct the soil moisture fluctuations (during the growing season of wheat) on the basis of incomplete data is described. Then, empirical estimates of the response function of wheat yield derived on the basis of a four-year irrigation experiment are presented; use is made of the Mitscherlich function. For the problem of deriving the optimal irrigation policy under conditions similar to those in the experiment (unstable rainfall), the soil moisture estimation model and the estimate of the Mitscherlich response functions have been applied in an analysis in which the rainfall record representing the random rainfall distribution at the experiment site for a period of 16 years is taken into account. Two approaches to irrigation decision are considered, and several irrigating policies derived from the approaches are compared by simulating their consequences in relation to the 16-year rainfall record. (Bell-Cornell)
W74-00669

CORONADO RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, PROGRAM OF ACTION.
Soil Conservation Service, Phoenix, Ariz.
For primary bibliographic entry see Field 04A.
W74-00755

JOJOBA AND ITS USES, AN INTERNATIONAL CONFERENCE, JUNE 1972.
University of Arizona, Office of Arid Lands Studies, Tucson, Arizona, June 1972. 81 p, 32 fig, 5 tab, 45 ref.

Descriptors: *Desert plants, *Xerophytes, Seeds, Seed treatment, *Planting management, Runoff, Plant populations, Crop production, Economic feasibility, Plant morphology.
Identifiers: *Jojoba, Liquid wax, Plant uses, Simmondsia chinensis.

Papers delivered at this first international conference on jojoba Simmondsia chinensis and its uses covered its distribution, chemistry of the seed, problems in the collection of seeds, and production under cultivation. Included were historical summaries and presentations of new research, especially in Israel, that will provide a basis for future developments. Experiments with planting, seed production potential, saponification and gas chromatographic analysis of jojoba wax esters, preparation of jojoba products, the effect of runoff farming for increased yields, and the need for additional agronomic and toxicity studies are discussed. The physical characteristics of the plant and its products are described, and the field experience with native stands in Arizona is delineated. The possibilities for commercial production as an Indian industry are shown. While enough seed may be collected from native stands for laboratory experiments, large-scale commercial use of its products will require plantations, such as have succeeded in Israel, and further research of jojoba as a horticultural plant, by

determining desirable genetic prototypes and variability factors is needed. As an arid-lands plant requiring very little water even in its cultivated state, and one with great economic possibilities, it deserves attention. (Paylore-Arizona)
W74-00756

RELATIONSHIP OF TRANSPIRATION TO ATMOSPHERIC VAPOR PRESSURE,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 02D.
W74-00759

EMERGENCE OF BUFFEL GRASS (CENCHRUS CILIARIS) FROM SEED AFTER FLOODING,
Department of Primary Industries, Mackay (Australia). Agricultural Branch.

E. R. Anderson.
Queensl J Agric Anim Sci. Vol 29, No 3, p 167-172. 1972.
Identifiers: *Buffel grass, Cenchrus-Ciliaris, *Flooding (Plants), Grasses, Seeds.

The emergence of 7 buffel grass cultivars after simulated flooding for 0, 10, 20, 30 and 40 days in pots was investigated. Seed of known germination was planted in an alluvial clay soil of medium to heavy texture and flooding imposed immediately. Seeding emergency did not occur until flooding ceased, and emergence took longer in flooded treatments than in the control. Flooding caused a marked reduction in seedling emergence. The ability of the buffel grass cultivars to emerge was in the following order: American and Boorara greater than Biloela, Nunbank and Tarewinnabar greater than Gayndah and Molopo. The last 2 cultivars failed or had negligible emergence in all flooding treatments.—Copyright 1973, Biological Abstracts, Inc.
W74-00768

BLEACHING EFFLUENT FOR IRRIGATION,
Stephen F. Austin State Coll., Nacogdoches, Tex.
For primary bibliographic entry see Field 05D.
W74-00787

FLOODING TOLERANCE OF PANICUM COLORATUM,
Department of Primary Industries, Mackay (Australia). Agricultural Branch.

E. R. Anderson.
Queensl J Agric Anim Sci. Vol 29, No 3, p 173-179. 1972.
Identifiers: *Flooding (Plants), *Panicum-Coloratum, *Panicum-Maximum.

Five P. coloratum cultivars and 1 of P. maximum were flooded in pots. Flooding damage was assessed by visually rating the induced chlorosis, counting live tillers/pot and measuring percentage dry weight of the plants. Superior flooding tolerance was shown by the cultivar 'Kabulabula C.P.I. 14375' and variety makarikariene cvs. 'Bambasi,' 'Burnett' and 'Pollock.' The results are compared with field information.—Copyright 1973, Biological Abstracts, Inc.
W74-00826

ADAPTABILITY OF MAIZE TO HIGH SOIL WATER CONDITIONS,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.

D. K. Das, and R. L. Jat.
Agron J, Vol 64, No 6, p 849-850, 1972.
Identifiers: Adaptability, *Aeration, Furrows, *Maize, Porosity, Ridges, *Roots, *Soil water, Zea-mays.

Maize (Zea mays L.) plants were grown in furrows and ridges in a lowlying sandy clay loam soil under high soil-water conditions. Root porosities of 44-day-old plants were studied. The investigation was

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undertaken to determine varieties that could adjust to such environment through internal aeration. Varietal differences were found in the percentage of air space of roots. Plants grown in furrows had higher root porosities than those grown in ridges. Six cultivars studied were 'Kissan,' 'Deccan,' 'Jawahar,' 'Ganga 5,' 'Vikram' and 'Sona.' The first 2 may adjust better to excess soil water due to greater internal aeration resulting from increased root porosities.—Copyright 1973, Biological Abstracts, Inc.
W74-00892

EFFECTS OF WATER AND HEAT ON SEEDLING EMERGENCE,

Institute for Land and Water Management Research, Wageningen (Netherlands).

R. A. Feddes.

J Hydrol (Amst). Vol 16, No 4, p: 341-359. 1972, Illus.

Identifiers: Bean, Beet, Gardens, Heat, Irrigation, *Moisture, Radish, Rainfall, *Seedling emergence, Soils, Spinach, *Temperature, Water, *Germination.

The combined effect of soil temperature and moisture content on seedling emergence was studied with 4 different kinds of vegetable seeds radish, spinach, broad bean and garden beet, in field experiments in a clay and a sandy loam profile, both with a shallow and a deep groundwater table. Various sowing dates were applied. The mean daily temperatures of the plots with the higher groundwater tables were 1-2°C lower than the temperature of the plots with the deeper groundwater tables. With the same groundwater depth, clay was warmer than sandy loams. The difference in groundwater level play a more important role than the difference in type of profile. The maxima and minima in the top soil were higher and the amplitudes decreased with depth faster in soils which had a deep groundwater table. The decrease was more marked in the clay than in the sandy loam soil. Seeds emerged earlier in sandy loam than in clay. The sandy loam plots with the shallow groundwater table showed the highest emergence rate as well as the highest total emergence percentage. The mean heat sums required for 50% emergence were lower on sandy loam than on clay, and the heat sums of the shallow groundwater plots were lower than those of the deep groundwater plots. The heat sum required for 50% emergence increased sharply below a matric pressure of -0.49 bar (above pF (water holding index) 2.7) of the soil. For a fast and adequate seedling emergence both a high temperature and a sufficient moisture content are necessary. By sprinkler irrigation the sowing bed can be kept at the desired moisture content.—Copyright 1973, Biological Abstracts, Inc.

W74-00930

COMPARATIVE DATA ON THE YIELD AND CHEMICAL COMPOSITION OF BEETS GROWN ON IRRIGATED AND DRY FARMS, (IN RUSSIAN),

L. A. Malieva.

Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 2, p 15-22. 1971.

Identifiers: *Beets, Chemical composition, Comparative data, Dry farms, Irrigated farms, *Crop yield.

Data on the yield of beets, biomass of the tops, and chemical composition of the plant organs are presented. The beet varieties most promising for cultivation in Tadzhikistan, USSR, are given.—Copyright 1973, Biological Abstracts, Inc.

W74-00980

THE DEPENDENCE OF WATER REGIMEN OF PALMETTE TYPE APPLE TREES ON THE WATERING METHOD, (IN RUSSIAN),

M. N. Zhulavskaya, T. N. Medvedeva, P. I. Kolos, and I. A. Tulbure.

Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 5, p 31-37. 1971.

Identifiers: *Apple trees (Palmette), Trees,

*Watering methods, *Metabolism, Water regimen.

There is a difference in water metabolism and utilization in the apple tree, depending on the mode of water delivery. Water delivered through sprinkling, especially at night, activates metabolism considerably. Water delivered through a trench shows high utilization from the soil.—Copyright 1973, Biological Abstracts, Inc.

W74-00981

STUDY OF ALGAE USED AS FOODS IN THE VALLEY OF MEXICO, (IN SPANISH),

Universidad Nacional Autonoma de Mexico, Mexico City.

For primary bibliographic entry see Field 02H.

W74-00982

THE USE OF TENSIOMETERS AS INDICATORS OF SOIL MOISTURE AVAILABILITY FOR PLANTS, (IN RUSSIAN),

Moscow State Univ. (USSR). Dept. of Physics.

N. A. Muromtsev, and I. I. Sudnitsyn.

Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 3, p 121-123. 1972. Illus. (English summary).

Identifiers: *Capillary pressure, Irrigation indicators, *Oats, *Soil moisture, *Tensiometers, Transpiration.

Capillary pressure (measured with tensiometers) at 0-0.5 atm corresponds to optimum soil moisture range for oats. The relative transpiration at this range is equal to unity but it decreases if capillary pressure goes below -0.5 atm. Tensiometers can serve as indicators for irrigation.—Copyright 1973, Biological Abstracts, Inc.

W74-00989

EFFECT OF RETARDANT CHLOROCHOLINE CHLORIDE ON CONTENT OF PROTEIN COMPONENTS IN PLANT LEAVES DURING DROUGHT, (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.

N. N. Kharanyan.

Dokl Akad Nauk SSSR Ser Biol, Vol 205, No 2, p 492-494, 1972.

Identifiers: Bean, Chlorides, *Chloro choline chloride, Drought, Leaves, *Protein, Retardants, Wheat, *Amino acids.

Experiments with wheat and bean plants showed that the protein content in leaves of plants pretreated with chloro choline chloride (CCC) during a drought is higher than in plants subjected to drought without CCC treatment (controls). The total quantity of free amino acids in the CCC-treated plants is lower than in the control plants. This fact may indicate a decrease of the breakdown of proteins in leaves of the CCC-treated plants under drought conditions, whereas protein breakdown and an increase of the content of amino acids are usually observed under these conditions.—Copyright 1973, Biological Abstracts, Inc.

W74-00996

EFFECT OF GROWTH REGULATORS ON WATER METABOLISM IN PLANT: I, IAA, TIBA (2,3,5-TRIHOBOENOIC ACID), GA (GIBBERELIC ACID) AND CCC (2-CHLOROETHYLTRIMETHYLLAMMONIUM CHLORIDE) ON HYDRATION OF TOMATO LEAVES AT VARIOUS SOIL MOISTURE CONTENTS, (IN POLISH),

Nicolas Copernicus Univ. of Torun (Poland).

Pracownia Fizjologiczna Roslin.

A. Chrominski.

Zesz Nauk Univ Mikolaja Kopernika Toruniu Nauki Mat-Przyr Biol. 14 p 189-207. Illus. 1972. (English summary).

Identifiers: Benzoic acid, Gibberellic acid,

*Growth regulation, Hydration, Leaves,

*Metabolism, Osmotic potential, Soil moisture,

*Tomato leaves.

CCC and IAA treatments decreased osmotic potential; TIBA increased it-decreased leaf hydration. The intensity of IAA and TIBA action and the direction of changes resulting from the application of GA were dependent on soil moisture content. (See also W74-01027)—Copyright 1973, Biological Abstracts, Inc.

W74-01026

EFFECT OF GROWTH REGULATORS ON WATER METABOLISM IN PLANT: II, IAA, TIBA (2,3,5-TRIHOBOENOIC ACID), GA (GIBBERELIC ACID) AND CCC (2-CHLOROETHYLTRIMETHYLLAMMONIUM CHLORIDE) ON TRANSPIRATION RATE AND STOMATAL APERTURES OF INTACT TO-MATO PLANTS, (IN POLISH),

Nicolas Copernicus Univ. of Torun (Poland).

Pracownia Fizjologiczna Roslin.

A. Chrominski.

Zesz Nauk Univ Mikolaja Kopernika Toruniu Nauki Mat-Przyr Biol. 14 p 209-228. Illus. 1972. (English summary).

Identifiers: Benzoic acid, Gibberellic acid, Growth regulation, *Metabolism, Soil moisture, *Stomatal apertures, *Tomato, *Transpiration rate.

IAA, TIBA and CCC decreased, while GA increased, the transpiration rate. IAA and TIBA statistically significantly decreased stomatal apertures. CCC insignificantly increased the stomatal apertures at low (25%) soil moisture and reduced the width of the stomata at normal (55%) soil moisture content. The effects of GA on behavior of the stomata were opposite to those of CCC. (See also W74-01026)—Copyright 1973, Biological Abstracts, Inc.

W74-01027

VARIATION IN SOIL FACTORS AND CROP YIELD ON A SANDY SOIL RICH IN ORGANIC MATTER, (IN NORWEGIAN),

O. Prestvik.

Meld Nor Landbrukshogsk. Vol 51, No 10, p 1-10, 1972. (English summary)

Identifiers: *Humus, *Organic matter, *Sandy soil, *Crop yield, Cation exchange, Soil chemistry.

In a coarse textured sand with humus content of 9-22% by weight in the upper layer, the water content and cation exchange capacity were positively correlated with humus content. Soil pH, soluble P and the degree of base saturation seemed to be negatively correlated with the content of organic matter. To a certain degree the crop yield varied in the same manner over the field from year to year. The yield was positively correlated with the humus content of the soil and also with other soil factors bound to the humus content. About 3/4 of the total variation in relative yield on an average for the period 1947-1951 could be explained by humus content and depth of the layer rich in humus: relative yield $\pm 62.11 + 1.78 \text{ loss of ignition } (\%) + 0.40 \text{ depth of upper layer rich in humus (cm)}$. The content of organic matter partly reflects the production of plant mass. A good supply of water keeps the humus content high, resulting in high crop yield.—Copyright 1973, Biological Abstracts, Inc.

W74-01051

COMPARATIVE EFFICIENCY OF THE AREA UNIT USED FOR FISH BREEDING AND OTHER AGRICULTURAL PURPOSES, (IN RUSSIAN),

Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).

For primary bibliographic entry see Field 081.

W74-01084

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

MOISTURE EXPENDITURE BY FOREST AND FIELDS IN THE PROTECTIVE AFFORESTATION REGIONS, (IN RUSSIAN), A. I. Mikhovich, Ya. K. Zarudny, and V. E.

Popova.

Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 20, p 113-119, 1970.

Identifiers: Forests, Forestation, *Moisture, *Oak, *USSR (Ukrainian), Agriculture, Soils.

Observations on moisture expenditure by forest stands and fields occupied by agricultural crops were conducted by the Ukrainian Scientific Research Institute of Forestry and by experimental stations in the Sumy, Donetsk, Voroshilovgrad (now Lugansk), Kirovograd, Kherson, Nikolaev and Vinnytsia regions of the Ukrainian SSR. Information is presented on the working methods, the characteristics of stands (age, height of stands, degree of stand closure) and of agricultural fields, with an indication of the field crop and the yield, as well as data on the total moisture expenditure by forest strips and fields. In the forest steppe and steppe of the Ukraine, it was established that the total moisture expenditure during the growing season by the young and middle-aged oak stands (in masses and in strips) is, as a rule, higher than the expenditure of the agricultural crops usual in these regions. In the 3-m thick layer of soil under forest strips and masses, less moisture was contained, as a rule, than in the neighboring field plots, though the spring reserves of soil moisture were almost equal to or even higher under forest. Copyright 1973, Biological Abstracts, Inc.

W74-01099

dent variables. Comparisons were made between travel times predicted from the equation for average stream velocity and travel times measured from dye-tracer studies. From the limited data available, it appears the equation for average velocity tends to underestimate travel times at high flows and over-estimate travel times at low flows. Only data for the north central and northwestern portions of Georgia were available for comparison.

W74-00556

SOCIAL AND CULTURAL IMPACT OF A PROPOSED RESERVOIR ON A RURAL KENTUCKY SCHOOL DISTRICT, Kentucky Water Resources Inst., Lexington. For primary bibliographic entry see Field 06B.

W74-00557

A REPORT OF PROGRESS AND CONCLUSIONS, (WASHINGTON, D.C. METROPOLITAN AREA WATER RESOURCES).

Washington Area Interstate Water Resources Program, D.C.

For primary bibliographic entry see Field 06D.

W74-00583

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN--VOLUME 2. COLORADO RIVER BASIN FROM GREEN RIVER TO COMPACT POINT.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W74-00586

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--VOL 3. UPPER MISSISSIPPI RIVER BASIN BELOW KEOKUK, IOWA.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W74-00587

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 4. OHIO RIVER BASIN BELOW WABASH RIVER.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W74-00588

STREAMFLOW FORMATION, COMPUTATIONS, AND REGULATION (FORMIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, L. B. Byshovets, editor, Moscow, 1971. 176 p.

Identifiers: *Natural streams, *Time, *Tracers, Dye releases, Time of concentration, Hydraulic properties, Streamflow, Flow measurement, Flow rates, Open channel flow, Discharge measurement, Backwater, Mannings equation, *Georgia, Computer programs, Path of pollutants. Identifiers: *Average velocity, Stream velocity.

Estimates of the time of travel of flow in natural streams are important to the hydrograph routine necessary for the planning and operation of flood control systems and to the routing of pollution movement needed for water management programs. Such estimates are particularly important when reacting to accidental spills that can contaminate downstream water supplies. This study develops, through multiple regression analysis of data on Georgia streams, prediction equations more accurate than current office approximations and less costly than tracer or other field studies. Data from discharge measurements by the US Geological Survey at 145 complete record stations in Georgia were used with the Biomedical Computer Program, BMDO2R, entitled 'Stepwise Regression.' Equations were developed for estimating average stream velocity, depth, width, and cross-sectional area from drainage area, mean basin elevation, mean annual precipitation, discharge and discharge frequency as the indepen-

Information is provided on formation and regulation of spring and storm runoff on rivers in the Ukraine and Moldavia. Procedures used to compute flood-wave movement in Dnieper River reservoirs are described in connection with the 75-

year flood which occurred on the Lower Dnieper between Kiev and Kakhovka in the spring of 1970. Flood data obtained from catastrophic floods in the Dniester, Prut, Seret, and Tisza River basins in the Ukrainian Carpathians in June 1969 and May 1970 are analyzed to define and interpret flood profiles. Storm-precipitation patterns in irrigated regions of southern European Russia are examined, and methods are presented for performing snowmelt and spring-runoff computations and for preparing a short-term forecast of daily water discharges of the Dnieper River at Kiev. (See W74-00593 thru W74-00601) (Josefson-USGS)

W74-00592

PROCEDURES FOR COMPUTING MOVEMENT OF SPRING FLOW ALONG THE CASCADE OF RESERVOIRS ON THE DNEIPEL RIVER (METODIKA RASCHETA DVIZHENIYA VESENNEGO STOKA PO KASKADU VODOKHRANILISHCH NA DNEPRE),

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).

I. A. Zheleznyak, L. B. Byshovets, and I. A.

Tkachenko.

In: Formirovaniye, raschety i regulirovaniye rechnogo stoka; Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 3-22, Moscow, 1971. 5 fig, 8 tab, 8 ref.

Identifiers: *Flood flow, *Flood waves, *Flood routing, *Flood discharge, *Reservoirs, Flood stages, Stage-discharge relations, Channels, Hydrographs, Water storage, Reservoir storage, Inflow, Water balance, Gaging stations, Computer programs, Curves, Equations.

Identifiers: USSR, *Dnieper River.

Procedures for calculating flood-wave movement along the cascade of reservoirs on the Dnieper River were based on methods of flood routing in individual river reaches and large reservoirs. Flood routing in a river involves solutions of water-balance equations for reaches in which average time of water movement approximates duration of the design time interval (day), with allowance made for change in channel storage. Flood routing in a large reservoir is reduced to a determination of its daily water balance with consideration for change in dynamic capacity depending on outflow stage and discharge. Computation of the movement of a flood wave from inlet gaging stations of the Dnieper Cascade (Mozyr' on the Pripyat', Rechitsa on the Dnieper, Gomel' on the Sozh) to Kakhovka includes calculations of the transformation of average daily water discharges in 16 river reaches and 5 reservoirs, performed with allowance for lateral inflow and reservoir operation during a flood period. A program was prepared for the EVM M-220 computer according to procedures proposed; calculations were made of flood wave movement in 1965-69, and estimates are given of the reliability of results. (See also W74-00592) (Josefson-USGS)

W74-00593

EXPERIMENT IN CALCULATING MOVEMENT OF THE 1970 FLOOD WAVE ALONG THE CASCADE OF DNIPEL RESERVOIRS (OPYT RASCHETA DVIZHENIYA VOLNY POLOVOD'YA 1970 G. PO KASKADU DNEPROVSKIKH VODOKHRANILISHCH),

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).

For primary bibliographic entry see Field 02E.

W74-00594

SHORT-TERM FORECAST OF DAILY DISCHARGES OF THE DNEIPEL RIVER AT KIEV DURING THE PERIOD OF THE 1970 FLOOD (O KRATKOSROCHNOM PROGNOZE

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface—Group 4A

YEZHEDNEVNYKH RASKHODOV DNEPRA U KIYEVA V PERIOD POLOVOD'YA 1970 G.), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). Ye. I. Kochelaba.

In: Formirovaniye, raschet i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 31-41, Moscow, 1971. 3 fig, 3 tab, 8 ref.

Descriptors: *Streamflow forecasting, *River forecasting, Flood forecasting, Floods, *Discharge (Water), Peak discharge, Stage-discharge relations, Routing, Hydrographs, Inflow, Reservoirs, Watersheds (Basins), Gaging stations, Equations.

Identifiers: USSR, *Dnieper River, *Kiev, Travel-time.

Conditions of formation of peak discharge of the Dnieper River at Kiev and the role of individual basins are analyzed. An accurate forecast of peak discharge at this station can be prepared on the basis of a short-term forecast of daily discharges. A short-term forecast of daily discharges of the river at Kiev during the period of the 1970 flood is based on stage-discharge relations at the inlet gaging station of each design reach. (See also W74-00592) (Josefson-USGS)
W74-00595

PROBLEM OF SIMPLIFYING SNOWMELT COMPUTATIONS (K VOPROSU OB UPROSSHCHENNOM RASCHETE SNEGOTAYANIYA), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02C.
W74-00596

CALCULATION OF SPRING RUNOFF DEPTH IN CARPATHIAN RIVERS (RASCHET SLOVA VESENNEGO STOKA REK KARPAT), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). A. V. Shcherbak.

In: Formirovaniye, raschet i regulirovaniye rechnogo stoka; Ukrainskiy Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 100, p 69-74, Moscow, 1971. 1 fig, 1 tab, 7 ref.

Descriptors: *Runoff, *Spring, *Rivers, Tributaries, Watersheds (Basins), Hypsometric analysis, Precipitation (Atmospheric), Snowmelt, Water equivalent, Antecedent moisture content, Freezing, Curves, Equations.

Identifiers: USSR, *Carpathian Mountains, *Dniester River.

The relation of average depth of total spring runoff on Carpathian tributaries of the Dniester River to average basin elevation is local in character. Spring runoff on Carpathian rivers is determined mainly by snow storage and liquid precipitation occurring during the period of runoff formation. The negligible effect of antecedent moisture content and soil freezing on spring runoff during the period examined (1947-67) is attributable to their small variability from year to year. (See also W74-00592) (Josefson-USGS)
W74-00597

FLASH FLOODS ON CARPATHIAN RIVERS IN JUNE 1969 AND MAY 1970 (LIVNEVYYE PAVODKI NA REKAHK KARPAT V IYUNE 1969, MAYE 1970 G.), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02E.
W74-00598

FACTORS RESPONSIBLE FOR FLOODFLOW IN CARPATHIAN RIVERS (AS ILLUSTRATED BY THE STRYY AND BYSTRITSA RIVERS) (FAKTORY PAVODOCHNOGO STOKA KARPATSKIKH REK (NA PRIMERS STRYYA I BYSTRITSY)), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02E.
W74-00599

COMPUTATION OF MAXIMUM STORM RUNOFF FOR DESIGNING EROSION CONTROL STRUCTURES IN SOUTHWESTERN EUROPEAN RUSSIA (RASHET MAKSIMAL'NOGO LIVNEVOGO STOKA PRI PROYEKTIROVANII PROTIVOEROZIONNYKH SOORUZHENIY V YUGO-ZAPADNOY CHASTI YETS), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02D.
W74-00600

SURFACE-GROUNDWATER RELATIONSHIPS ON THE EASTERN DNIESTER LEFT BANK (O VZAIMOSVYAZI PODZEMNYKH VOD NA VOSTOKE LEVOREZHNOGO PODNESTROV'YA), Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02A.
W74-00601

ALGORITHM FOR SOLVING A CLASS OF LINEAR PROGRAMMING PROBLEMS RELATED TO RESERVOIR MANAGEMENT AND DESIGN, Universidad Nacional del Sur, Bahia Blanca (Argentina). R. Alemany, P. Fernandez, and A. G. De Pouza. Water Resources Research, Vol 9, No 5, p 1227-1234, October 1973. 6 tab, 4 ref.

Descriptors: *Linear programming, *Algorithms, *Reservoirs, *Management, *Design, Decision making, Equations, Mathematical models, Systems analysis.

Identifiers: *Argentina (El Chocon Reservoir), Argentina (Limay River).

Detailed description is given of an algorithm for easily solving (by hand computation) a class of linear programming problems related to the use of the 'linear decision rule' in reservoir design and management. The method clarifies some theoretical aspects of the practical problem. For purposes of illustration, the algorithm is applied to the El Chocon Reservoir in southwestern Argentina. There has been interest in developing a quick and flexible method of calculation for discussing management alternatives for this reservoir, which has a planned capacity of 20,170 hm and contains both a power output of 1,200,000 kw and an irrigated capacity for 625,000 ha. (Bell-Cornell)
W74-00667

OPTIMIZATION MODEL FOR THE OPERATION OF FLOOD CONTROL SYSTEMS, Natal Univ., Durban (South Africa). Dept. of Civil Engineering. J. S. Windsor.

Water Resources Research, Vol 9, No 5, p 1219-1226, October 1973. 4 fig, 10 ref.

Descriptors: *Reservoir operation, *Flood control, *Linear programming, *Optimization, Reservoir storage, Reservoir releases, Costs, Flood damage, Downstream, Evaluation, Forecasting, Stochastic processes, Methodology, Mathematical models, Systems analysis.

Identifiers: *Cost minimization, Hydrometeorological conditions.

Recursive linear programming is used to determine the optimal operation of a system of flood control reservoirs. The system is operated over a number of discrete time periods, and the optimization model is used to determine the operating policy that minimizes the downstream damage costs associated with the magnitude of reservoir releases. The method recognizes component interaction in space and time. By dividing the flood period into shorter operational periods it is shown how the system policies may be adjusted to incorporate the latest forecast information and thus ensure maximum flexibility under actual operating conditions; using a series of sequentially-related linear programming routines to cover the entire flood period, the inputs to the model are adjusted at each time stage to reflect the changing storage and hydrometeorological conditions. It is assumed that decisions regarding the number, location, and size of the individual reservoirs in the system have previously been made. (Bell-Cornell)
W74-00668

CAPACITY DECISIONS IN A MULTIPURPOSE MULTIRESERVOIR SYSTEM, Montana State Univ., Bozeman. Dept. of Industrial and Management Engineering. S. Nayak, and S. R. Arora. Water Resources Research, Vol 9, No 5, p 1166-1177, October 1973. 6 fig, 4 tab, 17 ref.

Descriptors: Water resources, *Alternative planning, *Multiple-purpose reservoirs, *Reservoir capacity, *Sites, *Linear programming, Optimization, Water demand, Flood damage, Water shortage, Costs, Reservoir construction, Decision making, River basins, Benefits, Economies of scale, Equations, Mathematical models, Systems analysis, Mississippi River.

Identifiers: *Cost minimization, *Nonlinear programming, Separable programming, *Minnesota River basin.

Optimization techniques are proposed for selecting the best sites for construction of a system of multi-purpose reservoirs that will most economically meet the various water demands. The objective function minimizes the sum of the annual amortized cost of the reservoirs and the annual flood shortage losses less the annual recreational benefits. The problem is formulated using nonlinear programming and has the advantage of being separable into variables, both in the objective function and in the constraints. It is finally reduced to a linear programming problem by substituting the nonlinear relationships with piecewise linear approximations. Employed is the common approximate approach to the problem, which chooses the optimal design parameters on the basis of straight historical inflow data for a specified period. The optimization considers the flood inflows (based on a given flood frequency) and the drought inflows (based on the severest drought on record) simultaneously. Releases are constrained only by the availability of water, and their optimal values are determined by balancing damages downstream against the cost of providing storage to prevent them. The model is applied to U.S. Army Corps of Engineers data for the Minnesota River basin, and the results are compared with the plan proposed by the Corps. (Bell-Cornell)
W74-00672

DETERMINATION OF THE DISCHARGE POLICY FOR EXISTING RESERVOIR NETWORKS UNDER DIFFERING OBJECTIVES, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. G. Le Clerc, and D. H. Marks. Water Resources Research, Vol 9, No 5, p 1155-1165, October 1973. 3 fig, 4 tab, 3 ref.

Descriptors: *Multiple-purpose reservoirs, Networks, *Linear programming, *Reservoir

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

releases, Discharge (Water), *Drawdown, Management, Optimization, Costs, Design, Systems analysis, Economics, Recreation, Water supply, Streamflow, Rivers, Constraints, Mathematical models, Reservoir capacity.

Identifiers: *Discharge policy, *Operating policy, *Riviere du Nord (Quebec-Canada), Chance-constrained programming, Screening, Cost minimization.

For existing reservoirs an efficient policy implies maximization of the magnitude of the streamflow guaranteed at a given reliability level. Using a linear programming screening model, the discharge policy for a network of eight small existing reservoirs utilized for recreational activities and for water supply of a city downstream of the network is determined. The optimization problem is formulated by employing a linear operating rule, and chance-constrained programming is adopted to account for the stochasticity of the inflows. Two objective functions are introduced to study the cost of a more 'equitable' distribution of the losses due to surface drawdowns versus the most 'efficient,' which minimizes the total summation of the individual drawdowns; comparison of the solutions leads to quantification of the additional cost that society has to pay for a discharge policy that is equitable rather than efficient. A case study on the Riviere du Nord, Quebec, Canada is presented. Results show that the linear operating rule is valid for existing reservoir analysis; observed also is that chance-constrained programming may have serious ineptitudes for design purposes and for analysis of large existing reservoir networks. The approach, however, is a desirable management tool for systems of small reservoirs, primarily as a screening model. (Bell-Cornell)

W74-00673

FLOW AND CHANNEL CHARACTERISTICS OF TWO HIGH MOUNTAIN STREAMS,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. B. H. Heede.

USDA Forest Service, Research Paper RM-96, October 1972. 12 p, 9 fig, 5 tab, 11 ref.

Descriptors: Hydraulics, *Open channels, *Channel morphology, *Channel flow, Hydraulic properties, *Slope stability, *Discharge (Water), Regime, Reynolds number, Froude number, Turbulent flow, Transition flow, Colorado.

Identifiers: *Mountain streams, *Hydraulic geometry, Step formation, Bed material movement, Floodplain forest management, Channel shape, Sediment movement.

Steps provided by logs fallen across the channel added to flow energy reduction. The streams required an additional number of gravel bars to adjust to slope. Average step length between logs and gravel bars are strongly related to channel gradient and median bed material size. More bars formed when fewer numbers of logs were available. Although these are 'rushing mountain streams,' most values for flow velocities ranged between 0.5 and 2.5 feet per second. Exponents of functions expressing rate of change of depth or velocity, respectively, with discharge, indicated that dynamic stream equilibrium was attained. Implications for forest management are that sanitation cuttings (removal of dead and dying trees) would not be permissible where dynamic stream equilibrium exists and bed material movement should be minimized. (Forest Service)

W74-00678

EFFECT OF SNOW FENCE HEIGHT ON WIND SPEED,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 03B.

W74-00691

PRELIMINARY RESULTS OF WATER LEVEL CONTROL ON SMALL PLOTS IN A PEAT BOG,

Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station. D. H. Boelter.

In: Proceedings Fourth International Peat Congress, Helsinki, Finland, June 25-30, 1972. I-IV, p 347-354. 3 fig, 6 ref.

Descriptors: *Organic soils, *Controlled drainage, *Evapotranspiration, *Subsidence, Micrometeorology, Wetlands, Peat, Bogs, Water table, Hydrologic properties, *Minnesota, Watershed management, Demonstration watersheds.

Identifiers: *Water level control, Wetland hydrology, Peatlands, Bog vegetation, *Peat bogs.

Bottomless metal tanks driven into the organic soil were used to study the effect of water level control in a peat bog. Water levels were maintained at depths of 0.0 m., 0.3 m., and 0.6 m. The two lower water levels resulted in subsidence of 3.5 to 6.0 cm. in 2 1/2 years, due primarily to settling of the undecomposed surface peat material as water was drained from it. By contrast, the surface elevation in high water level plots rose 6.0 to 9.0 cm. due to the rapid growth of sphagnum moss. Sedges and cotton grass became more dominant in high water level plots. Labrador tea became the most prominent vegetation in the low water level plots and sphagnum moss dried up. Evapotranspiration in the low water level plots was estimated to be less than half of that in the high water level plots. The lower evapotranspiration is attributed primarily to reduced evaporation by sphagnum mosses. (Forest Service)

W74-00694

VEGETATION CHANGES AS A RESULT OF SOIL RIPPING ON THE RIO PUERCO IN NEW MEXICO,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. E. F. Aldon, and G. Garcia.

Journal of Range Management, Vol 25, p 381-383. September 1972, 1 fig, 1 tab, 6 ref.

Descriptors: *Soil treatment, *Soil moisture, *Forage grasses, Runoff, Flood plains, Forage palatability, Precipitation, *New Mexico, Demonstration watersheds, *Ranges.

Identifiers: *San Luis watershed (N Mex), *Soil ripping, Ground cover, Grazing management, Perennial grasses.

Soil ripping in 1963 effectively reduced runoff on the San Luis watershed of the Rio Puerco, New Mexico, and caused a favorable shift in forage production from galleta to alkali sacaton. Ripping effects on runoff are short-lived, but forage production patterns may persist for 10 years. (Forest Service)

W74-00696

DEVELOPMENT OF A SELECTIVE ALGACIDE TO CONTROL NUISANCE ALgal GROWTH,

Dow Chemical Co., Freeport, Tex. Texas Div.

For primary bibliographic entry see Field 05G.

W74-00702

MALEZAS ACUATICAS, AQUATIC WEEDS, J.

M. BRISTOW,

Colombian Agricultural Inst., Bogota.

J. M. Bristow, J. Cardinas, T. M. Fullerton, and J. Sierra.

1971. 116 p. 55 PHOTOS, 24 REF.

Descriptors: *South America, *Systematics, *Aquatic weeds, Floating plants, Submerged plants, Rooted aquatic plants, Habitats, Climatic zones, Aquatic plants.

Identifiers: *Colombia (South America), Plant propagation, Dissemination, Emergent plants.

The serious economic problem of aquatic weeds in Colombia, South America, becomes more acute with construction of new irrigation systems and reservoirs. With increasing contamination of canal waters by run-off of agricultural fertilizers and sewage, the problem is likely to become worse. In order to formulate suitable measures for the chemical control of these weeds, it is essential to know the species or at least the genera. Pictured in color are 55 common species which permit easy visual identification. The classification and a simple description of each species is given, together with their habitats, the climate in which each is found, and their modes of propagation. Dispersion may be by water or by birds. Many has been responsible for the world dissemination of some of the most noxious aquatic weeds such as Eichhornia, Salvinia, Elodea, Hydrilla, and Alternanthera. (Jones-Wisconsin)
W74-00736

SHORELINE MANAGEMENT INVENTORY.

Renton Planning Dep., Wash.

October, 1972. 52 p, 10 fig, 15 tab, 4 append.

Descriptors: *Shores, *Washington, Shore protection, Lake shores, Planning, Land use, Land tenure.

Identifiers: *Shoreline management, Environmental inventory, *Seattle (Wash), Lake Washington.

An inventory is presented of natural characteristics of shorelines in the Seattle suburb of Renton, as required by the State of Washington's Shoreline Management Act of 1971. Portions of shoreline on Lake Washington, Cedar River, Green River, Black River, Springbrook Creek, and May Creek in the inventory extend to an area at least 500 feet from ordinary high water marks of these shorelines. Items noted include existing land and water uses, generalized land ownership patterns, river and lakeshore classifications, mineral resources, water level fluctuation, characteristic animals, soil types and capabilities, characteristic vegetation, and almost 6.5 miles of shore defense works. Shore-related plans and programs are summarized; public plans include construction of a channel to minimize flood damage in an industrial area, relocation and widening of a creek, a link in a Cedar River Trail System, a regional park along May Creek, improvement of a lakefront airport, and expansion of Lake Washington Beach Park. There are private plans for a commercial-recreational development on 60 lakefront acres. Proposed capital improvements for 1973-1978 are mapped. (Stein-North Carolina)
W74-00741

POLICY PLAN FOR DEVELOPMENT OF LANSING'S WATERFRONT.

Waterfront Development Board, Lansing, Mich.

For primary bibliographic entry see Field 03D.

W74-00742

A REPORT UPON WEST CENTRAL MARICOPA COUNTY, ARIZONA: VOLUME I, A STUDY OF PHYSICAL ENVIRONMENTAL FACTORS AS A BASIS FOR LAND USE PLANNING.

Maricopa County Planning and Zoning Dept., Phoenix, Ariz.

For primary bibliographic entry see Field 03D.

W74-00746

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1972.

Honolulu Board of Water Supply, Hawaii.

For primary bibliographic entry see Field 06B.

W74-00749

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface—Group 4A

LAMAR COUNTY: LAND USE SURVEY AND ANALYSIS, LAND USE PLAN, HOUSING, WATER AND SEWER, OPEN SPACE.
West Alabama Planning and Development Council, Tuscaloosa.
For primary bibliographic entry see Field 05D.
W74-00750

CORONADO RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, PROGRAM OF ACTION.
Soil Conservation Service, Phoenix, Ariz.

May 1973. 133 p, 7 map, 13 tab, charts.

Descriptors: Natural resources, *Conservation, *Water resources, *Land use, *Project planning, Governmental interrelations, *Arizona, Recreation, Wildlife, Irrigation, Surveys, Resources development.

The project area is bounded by Mexico on the south and New Mexico on the east. It has a land area of nearly 9 million acres, of which 27 percent is privately owned, 38 percent federally administered, 24 percent state owned, and 11 percent Indian reservations, all lying within four counties. Of a total population of nearly 100,000, over 42 percent live in rural areas, with only two communities of more than 10,000 persons. The Program of Action presented is an effort to outline problems, opportunities and actions that will be taken to conserve, improve, and develop the resources of this 4-county project area. Surface water is scarce because of generally low rainfall, and irrigation water for the 230,000 acres in irrigated farmland comes from pumped deep wells. Because of a falling water table, project measures are proposed to achieve more efficient use of irrigation water by improving delivery systems and accelerating technical assistance for water management. The socio-economic, natural, agricultural, and recreation resources of the area are detailed, including climate, geology, minerals, ground and surface water, watershed, and soils, along with cropland and major plant communities. Supporting maps and tables show land ownership, annual precipitation, irrigated and urban lands, wildlife habitats, and watershed inventories. A short term plan for fiscal 1974 is appended. (Paylore Arizona)

W74-00755

SOME ASPECTS OF WEED CONTROL IN VINEYARDS, (IN ITALIAN).
For primary bibliographic entry see Field 05G.
W74-00767

FLOOD STUDIES FOR SAFETY OF TVA NUCLEAR PLANTS: HYDROLOGIC AND EMBANKMENT BREACHING ANALYSIS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 08A.
W74-00805

NUMERICAL SIMULATION OF UNSTEADY FLOWS IN RIVERS AND RESERVOIRS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W74-00816

FLOOD MANAGEMENT PLAN—WARNING, DAMAGE, COORDINATION.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 06F.
W74-00817

HEC-1, FLOOD HYDROGRAPH PACKAGE—USERS MANUAL, COMPUTER PROGRAM 723-X6-L2010.
Hydrologic Engineering Center, Davis, Calif.

For primary bibliographic entry see Field 07C.
W74-00821

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—USERS MANUAL.

Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-00822

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—PROGRAMMERS MANUAL.

Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-00823

WATER RESOURCES DATA FOR NEW YORK, 1972. PART 1. SURFACE WATER RECORDS.

Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 07C.
W74-00825

THE TIDAL POWER POTENTIAL OF UNGAVA BAY AND ITS POSSIBLE EXPLOITATION IN CONJUNCTION WITH THE LOCAL HYDROELECTRIC RESOURCES,

Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
G. Godin.

Manuscript Report Series No 30, 1973. 78 p, 20 fig, 7 tab, 11 ref.

Descriptors: *Water resources development, *Tidal waters, *Canada, *Hydroelectric power, Projections, Water yield, Tidal effects, Tidal powerplants, Planning, Tidal energy, Electric power production.
Identifiers: *Ungava Bay (Canada).

The principles underlying the exploitation of tidal energy and estimated power potential of the bays and estuaries on the periphery of Ungava Bay, Canada, as well as the hydro potential of the rivers of the Ungava hinterland are reviewed. The Payne, the Leaf, the Koksoak-Larch-Kaniapiskau system, the Whale and the George Rivers all have their sources in the interior highlands and drop from heights ranging from 220 to 740 m above sea level. The Koksoak has a mean discharge of 2,420 cubic meters/sec. Together, they have a power potential of 12,000 MW. The tidal range (water level change) at the entrance of the Koksoak River in Ungava Bay may reach 12.6 m, while inside Leaf Basin a little further to the northwest, it may get as high as 13.4 m. The range at Saint John, N.B., half-way up the Bay of Fundy is about 10 m. Considering that the volume of water contained in Ungava Bay is five times as large as in the Bay of Fundy, much more tidal energy is present in Ungava Bay. (Woodard-USGS)

W74-00838

SOME IMPORTANT PROBLEMS IN MODERN LIMNOLOGY (OB NEKOTORYKH VAZHNYKH ZADACHAKH SOVREMENNOGO OZEROVEDENIYA),

Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
For primary bibliographic entry see Field 02H.
W74-00839

VARIABILITY OF ANNUAL RUNOFF AND PRECIPITATION VALUES (OB IZ-MENCHIVOSTI GODOVYKH VELICHIN STOKA I OSADKOV),

Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. S. Zhdanova, L. V. Ivanova, and D. Ya. Ratkovich.
Vodnye Resursy, No 1, p 95-105, 1973. 4 fig, 6 tab, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Annual, *Variability, *Statistical methods, Runoff coefficient, Probability, Curves, Equations.
Identifiers: *Kazakhstan (USSR), Skewness.

Investigation of variability of annual runoff and annual precipitation was based on extensive field observation data. The coefficient of variation of precipitation is very stable and generally varies between 0.2 and 0.3; the coefficient of skewness is assumed to equal 1.5. Variability of annual runoff is higher than variability of precipitation; the ratio of these values increases with the increase in the index of dryness. The coefficient of skewness ranges from 1.5 to low runoff variability to 2 at high runoff variability. Proposals to normalize the coefficient of skewness of annual river runoff in Kazakhstan at 2.5 lack sufficient validity. (Josephson-USGS)
W74-00844

CONSIDERATION OF THE CHARACTER OF SURFACE-GROUNDWATER RELATIONSHIPS AND STREAMFLOW IN ESTIMATES OF YIELDS FROM INFILTRATION GALLERIES (UCHET KHARAKTERA SVYAZI PODZEMNYKH VOD S POVERKHINOSTYMI I REZHIMA RECHNOGO STOKA PRI RASCHETAHK INF IL'TRATSIONNYKH VODOZABOROV),

Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 08A.
W74-00848

INCREASING PROTECTION FOR OUR WATERS, WETLANDS, AND SHORELINES: THE CORPS OF ENGINEERS.

For primary bibliographic entry see Field 06E.
W74-00858

PRICKETT CREEK WATERSHED, WEST VIRGINIA (FINAL ENVIRONMENTAL STATEMENT).

Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-WV-73-0298-F, \$4.25 in paper copy, \$1.45 in microfiche. February 1973. 37 p, 1 map, 1 append.

Descriptors: *West Virginia, *Environmental effects, *Flood control, Watershed development, Comprehensive planning, Land use, Channel improvements, Flood prevention, Erosion, Recreation, Flood plain management, Water quantity control, Levees, Sediment control, Floodproofing.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements.

The Prickett Creek Watershed Project in West Virginia is to be carried out by sponsoring local organizations with federal assistance under the provisions of Public Law 566. The project will consist of conservation land treatment measures, one single-purpose floodwater retarding structure, and 7,030 feet of channel work to include levees, floodwalls and stream channel work. Planned measures will provide flood and sediment protection primarily to residences and industrial properties and transportation facilities in the Prickett Creek Watershed. Probable favorable effects of the project will be flood and sediment protection for improvements in the watershed and downstream areas of the Monongahela and Ohio Rivers, stabilization of critically eroding areas, provision for a year-round fishery for public use, and the creation of job opportunities. Adverse effects expected include temporary increase of turbidity and sedimentation of stream water and decreased protective vegetation. Alternatives considered were flood proofing, flood plain management, flood insurance, land treatment measures only, and simply leaving the creek as it is. (Mockler-Florida)
W74-00860

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

PROJECTS PROPOSED FOR INCLUSION IN OMNIBUS RIVER AND HARBOR AND FLOOD CONTROL LEGISLATION—1972.

For primary bibliographic entry see Field 06E.
W74-00872

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).

Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as EIS-MO-73-0099-F \$4.50 in paper copy, \$1.45 in microfiche. January 18, 1973. 40 p., 2 map.

Descriptors: *Missouri, *Levees, *Environmental effects, *Missouri River, Dams, Flood control, Flood prevention, Drainage, Water quality control, Agriculture, Rivers, Habitats, Channel improvement, Sediment load.

Identifiers: *National Environmental Policy Act, *Environmental Impact Statements, *Chariton County, Mo.

The proposed project would consist of the construction of a flood control project composed of a system of levees, interior drainage structures, and channel relocations and modifications. It would provide flood protection, modify and relocate a creek, increase sediment load into a lake, and preserve the recreational potential of a lake. The modification of five miles of the creek would change the natural character of the channel, associated stream biota, and the adjacent wildlife habitat; the recreation potential of this natural creek would be reduced. Moreover, the levee construction would destroy grass, forbs, timber, and other wildlife habitat. Alternatives to the proposed project include no action at all, diversion of the creeks involved, additional channel and levee construction, and a lower height of main stem levees. The total area to be protected by the proposed levee system amounts to 19,000 acres of which 14,700 are agricultural. The major crops raised are corn, wheat, and soybeans. The conclusion reached is that the adverse effects are ameliorated or outweighed by the potential favorable effects so that the project should be implemented. (Mockler-Florida)

W74-00879

GILLHAM LAKE, COSSATOT RIVER ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.

Available from National Technical Information Service, U.S. Dep't. of Commerce as PB-202 134-F-2, \$3.00 paper copy; \$1.45 microfiche. August 31, 1971. 285 p.

Descriptors: *Arkansas, *Environmental effects, *Reservoirs, *River basin development, Dams, Water quality standards, Aesthetics, Planning, Water supply, Water pollution control, Aquatic environment, Recreation facilities, Flood protection, Watershed management.

Identifiers: *Environmental Impact Statements, *National Environmental Policy Act, *Gillham Lake, Ark.

The Gillham Dam and Reservoir was authorized for construction in 1959 for purposes of flood control, water supply, water quality control, and fish and wildlife preservation. At full pool, 13.5 miles of the Coassatot River would be inundated, forming a 4,680-acre lake. Normal lake levels or conservation pool levels will create a 1,370-acre lake, inundating 7.5 miles of the Cossatot River. Since recreational development along the Cossatot River is nonexistent, this project would serve as the site of extensive recreational projects. Environmental degradation would be minor with recreation developments occupying minimal space and constructed in a manner compatible with the environ-

ment. On the other hand, preserving the Cossatot River as a scenic and recreation river would result in few, if any, benefits, although there will be a loss in that the project will irretrievably and irrevocably commit the area to use as a reservoir. (See also W73-15137 and W74-00882) (Mockler-Florida)

W74-00881

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX II (PHOTOGRAPHS), APPENDIX III (ENVIRONMENTAL ELEMENTS), (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.

Available from National Technical Information Service, U.S. Department of Commerce as PB-202 134 F-3, \$3.00 paper copy, \$1.45 microfiche. January 10, 1972. 138 p., 9 map, 58 photo, 38 tab.

Descriptors: *Arkansas, *Environmental effects, *Reservoirs, Dams, Planning, Water quality standards, Wildlife habitat, Aquatic environment, River basin development, Flood control, Water pollution control, Recreation facilities.

Identifiers: *Environmental impact statement; *National Environmental Policy Act; *Gillham Lake area, Howard and Polk Counties, Ark.

The environmental impact of the Gillham Dam is discussed with reference to the geologic factors. There are no known mineral resources in the Gillham project area. The most important adverse effect of the Gillham project on the mineral resources is the reduced natural replenishment of commercial sand and gravel deposits on the lower Cossatot River. In addition, the building of Gillham Dam will cause a loss of the river bottom site hardwoods, but not a complete loss of those on the bottomland. To a certain extent many of the bottomland hardwoods will return to the lake shore after an interim period. Fish currently occupying the headwaters of the Cossatot are expected to continue to maintain healthy populations upstream from the lake. The impoundment of Gillham Lake is not expected to create a serious mosquito breeding problem because of the steep, mountainous topography and the absence after impoundment of large, flat shallow water areas which would be conducive to establishment of aquatic vegetation. The ultimate project operation will also provide 28 c.f.s. average annual releases for downstream water quality requirements through a 50-year drought. (See also W74-00881) (Mockler-Florida)

W74-00882

SCIENTIFIC ALLOCATION OF WATER RESOURCES, WATER RESOURCES DEVELOPMENT AND UTILIZATION - A RATIONAL APPROACH,

Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.

For primary bibliographic entry see Field 06A.

W74-00885

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME I.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.

W74-00888

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME II.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.

W74-00889

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY—PROCESSES AND RESOURCES, VOLUME I.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.

W74-00890

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX D—MAP FOLIO.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.

W74-00924

SYSTEMS ENGINEERING APPROACH,

Texas Water Development Board, Austin. Systems Engineering Div.

For primary bibliographic entry see Field 06A.

W74-00940

MOISTURE BALANCE IN THE OAK FORESTS ON THE NORTHERN DONETS RIGHT BANK, (IN RUSSIAN),

A. I. Mikhovich.

Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 20. p 103-112. 1970.

Identifiers: Forests, Interception, *Moisture balance, *Oak forests, Precipitation, Runoff, Transpiration, *USSR (Donets River), River banks.

The results are given of 10-yr stationary hydrological investigations in various types of oak stands of the Mayaki Forest of the Slavyansk Forest Lumbering Farm in the Donetsk region, as well as brief characterization of weather conditions during each year. The interception of precipitation by tree crowns in dry (D1) and mesic (D2) oak stands, as well as soil freezing, snow accumulation and the duration of snow melt, surface runoff, total evaporation under the forest canopy, accumulation and expenditure of moisture in 3 m thick soil-ground layers, moisture balance during the growing season according to years dynamics of soil humidity, depth of wetting, the drying of the ground soils and water expenditure for plant transpiration were all studied. The immense water-regulating and soil protective role of the oak forests on the slopes is indicated. The almost complete absence of the summer storm runoff in oak forests and the reduction to a minimum of the annual surface runoff (the coefficient of the annual surface runoff varies in dry oak forests according to years from 0.000-0.033, and from 0.000-0.072 in fresh oak forests) prevent the washing out of soil from the bank slopes, and the silting of the bed of the Northern Donets River.—Copyright 1973, Biological Abstracts, Inc.

W74-00983

COURSE OF PHYTOGENESIS FORMATION IN CLOSED SHALLOWS OF FLOOD BAND OF THE KIEV HYDROELECTRIC STATION RESERVOIR, (IN UKRAINIAN),

L. S. Balashov.

UKR Bot Zh. Vol 29, No 2, p: 191-195. 1972. (English summary).

Identifiers: Bogs, Flood bands, Fodder, Forests, Hydro electric plants, *Phylogenesis formation, Reservoirs, *USSR (Kiev reservoir), Waterfowl nesting.

The character of developing basin overgrowth is considered in the flood band of the Kiev (USSR) reservoir forests and bogs as well as in the temporal basins. The rather slow process of growing is observed: for 5 yr, only duckweed is distributed everywhere in the closed basins and other higher aquatic plants are met rarely. Some basins are typically oligotrophic. Their total area in the forests region is 1500 ha. It would be expedient to make the most efficient use of these basins for nesting of waterfowl which necessitates enriching the flora with valuable food plants.—Copyright 1973, Biological Abstracts, Inc.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface—Group 4A

W74-01011

EFFECT ON FLOOD INTRODUCED PLANTS IN THE DESNA RIVER FLOOD PLAIN NEAR OS-TRA, (IN UKRAINIAN),

A. I. Barbarych.

Ukr Bot Zh. Vol 29, No 4, p: 517-520. 1972, (English summary).

Identifiers: *Floods, Floodplain, Rivers, Temperature, *USSR (Desna River), Plant communities.

A list of plant species which died as a result of long flooding during the severe flood in 1970 in flood plain of the Desna river (USSR) (from 3 till 4 wk under a water layer to 2 m) as well as a list of species which endured it are presented. The negative effect of flood on the introduced plants intensifies if, besides the long period of flood, there is influence of water high temperature, as was observed during the flood in 1931.—Copyright 1973, Biological Abstracts, Inc.

W74-01013

CHANGES OF PLANT COMMUNITIES IN OVERTURNED BODIES OF WATER OF THE AMU-DARYA DELTA, (IN RUSSIAN),

For primary bibliographic entry see Field 02L.

W74-01018

PLANTATIONS OF CONIFEROUS TREE SPECIES, (IN RUSSIAN),

For primary bibliographic entry see Field 02I.

W74-01023

IN SEARCH OF NEW METHODS FOR RIVER SYSTEM PLANNING,

Harvard Univ., Cambridge, Mass. Graduate School of Public Administration.

A. Maass, and M. M. Hufschmidt.

Journal of the Boston Society of Civil Engineers, Vol 46, No 2, p. 99-117, April, 1959. 1 fig.

Descriptors: *Water resources development, Planning, *Methodology, *Mathematical studies, *Idaho, Simulation analysis, Mathematical models, Cost-benefit ratio, *River basin development.

Identifiers: *Maximizing-net benefits, *Planning techniques, *Clearwater River Basin (Idaho).

The research goal of the Harvard water resource planning and development program was to improve methodology for the planning and design of multi-unit, multi-purpose water resource systems. The objective of improved planning techniques was to approximate that unique combination of system units and purposes which will maximize net benefits. This is a point where (1) the marginal benefits are equal for the last dollar spent in producing each output and (2) marginal costs equal marginal benefits for each output and for the system as a whole, if there are no monetary or budgetary constraints—or if such constraints are effective, marginal costs for an increment of output are equal for all system units. The production function, the physical relation between inputs and outputs, is important. Based on data for Clearwater River Basin, Idaho, a prototype river basin system, with 4 storage dams, 1 diversion dam, 2 power plants, and 1 system of irrigation distribution works, was developed representing three purposes—irrigation, power, and flood control. Techniques for determining the production function were: (1) 'working around the edges,' essentially the method than used for selecting, by engineering judgement and experience, a limited number of combinations for detailed investigation and analyzing these; (2) simple mathematical models, abstracting the problem so that most of the analysis could be handled by standard mathematical methods; and (3) simulation of the system on high-speed electronic digital computers under given assumptions regarding natural flow hydrolo-

gy; levels of time patterns of outputs; sizes of reservoirs, power plants, canals and other system units; operating policy; and costs and benefit functions. (Edwards-North Carolina)

W74-01029

STORM DRAINAGE STUDY, (CHATHAM COUNTY-SAVANNAH, GEORGIA).

Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

July, 1972. 26 p, 4 maps. HUD-GA-04-00-0166.

Descriptors: *Flooding, *Drainage, *Drainage systems, *Storm runoff, Flood damage, Drainage programs, Canals, Culverts, Water quality, Tidal effects priorities, Costs, Land use, *Georgia.

Identifiers: *Savannah (Geo).

Storm water drainage is a significant problem in the Savannah metropolitan area as the topography is quite flat, tidal action often reduces the hydraulic gradient of the drainage canals, and vegetation and debris in the canals retard water flows. Numerous projects to improve storm water drainage, some policies with regard to the provision of drainage by subdivision developers, possible assistance programs through the U.S. Army Corps of Engineers, and the water quality aspect of storm runoff are discussed. The proposed projects, consisting mostly of new channels, tidal gates, pumping stations, and enlarged culverts, are presented of a drainage basin basis and then ranked in terms of importance. Cost estimates for the 2B ranked projects are also included. Much of the improvement program consists of enlarging and maintaining existing canals and culverts to relieve flooding conditions in existing urban areas rather than extending drainage facilities to newly urbanizing areas. (Elfers-North Carolina)

W74-01031

NORTH CAROLINA WATER PLAN-PROGRESS REPORT, CHAPTER 35-NEW RIVER BASIN.

For primary bibliographic entry see Field 06B.

W74-01033

MASTER PLAN FOR MAJOR DRAINAGE: HENRY'S LAKE AREA, SUBBASIN 1-31-55-01-01.

Denver Regional Council of Governments, Colo.

For primary bibliographic entry see Field 06B.

W74-01037

A PROGRAM FOR STORM DRAINAGE AND FLOOD CONTROL-1971-1990: DAMAGE PREVENTION, MAJOR DRAINAGEWAYS, MASTER PLANNING, REGIONAL MANAGEMENT.

Denver Regional Council of Governments, Colo.

For primary bibliographic entry see Field 06F.

W74-01038

ANALYSIS OF PORT DEVELOPMENT POTENTIAL AT GREAT SODUS BAY.

Genesee/Finger Lakes Regional Planning Board, Rochester, N.Y.

For primary bibliographic entry see Field 06B.

W74-01039

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE-1970.

Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.

For primary bibliographic entry see Field 06B.

W74-01045

WATER-RELATED FACILITIES STUDY FOR THE COMPREHENSIVE REGIONAL PLAN OF

COLUMBUS AND FRANKLIN COUNTY (OHIO).

Burgess and Niple, Ltd., Columbus, Ohio.

For primary bibliographic entry see Field 06B.

W74-01048

CLASSIFICATION AND EVALUATION OF FRESHWATER WETLANDS AS WILDLIFE HABITAT IN THE GLACIATED NORTHEAST, Rhode Island Univ., Kingston. Dept. of Forest and Wildlife Management.

For primary bibliographic entry see Field 06B.

W74-01052

DESIGN OF SMALL DAMS.

Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

For primary bibliographic entry see Field 08A.

W74-01058

FLOOD STUDIES,

Bureau of Reclamation, Denver, Colo. Flood Hydrology Section.

For primary bibliographic entry see Field 08A.

W74-01061

STUDY OF THE CONDITION AND GROWTH OF FOREST PLANTATIONS, (IN RUSSIAN), G. S. Ivanov.

St Rab Po Less Khoz Mold Len Opytn Stn. 4, p 85-128, 1970.

Identifiers: *Black locust, Cutting, Forest plantations, Growth, *Oak, Plantations, *USSR (Gerbovetskii Forest).

Investigations conducted in the Gerbovetskii Forest (Moldavia) established that the main cause of the problems of oak and black locust plantations under dry conditions is the excessive density of the stands. The use of moisture-loving oak forms (from the floodplain, the lower parts of ravines) in dry habitats is an additional factor determining the problem of oak plantations. Crises occur when the oak is 15-20 yr old and the black locust 8-10 yr old. Well developed trees should be formed by improvement cuttings from an early age, establishing oak plantations in accordance with 2-story variants of the woody-shady type. A list is presented of 82 factors of scientific significance in the Gerbovetskii Forest for the purpose of studying the growth of stands with the participation of various tree species. The necessity of establishing plantations which are of optimum composition is based on the principles of the age-class theory as indicators of the degree of resistance. The principle of optimum improvement cuttings is discussed.—Copyright 1973, Biological Abstracts, Inc.

W74-01071

AQUATIC VEGETATION OF FISHPONDS OF THE WESTERN REGIONS OF THE UKRAINE, (IN RUSSIAN), Ukrainian Research Inst. of the Fish Industry, Kherson (USSR).

R. L. Arenkova.

Rastit Resur. Vol 8, No 2, p 229-236, 1972. Illus.

Identifiers: *Aquatic vegetation, *Macrophytes, Ponds, *USSR (Ukraine), Fishponds, Water chemistry.

The fishponds of the western regions of the Ukraine are severely overgrown with macrophytic plants. Overgrowths occupied from 10-95% of the area 141 of the 177 ponds investigated. The maximum density of overgrowth and the biomass of the macrophytic plants was noted between the end of June and the middle of July, and then decreased toward fall. The distribution of macrophytic plants was closely related with water chemistry and bottom deposits.—Copyright 1973, Biological Abstracts, Inc.

W74-01075

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

HEC-4, MONTHLY STREAMFLOW SIMULATION, COMPUTER PROGRAM 723-XG-L2340.
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07C.
W74-01091

DEVELOPMENT OF A SNOWMELT-RUNOFF MODEL FOR THE U.S. TUNDRA BIOME, PROGRESS REPORT,
For primary bibliographic entry see Field 02C.
W74-01094

VEGETATION AND STRATIGRAPHY OF BOGS OF THE EASTERN FOREST-STEPPE, (IN RUSSIAN),

Akademiya Nauk USSR, Kiev. Instytut Botaniki.
A. I. Kuz'mychov.
Ukr. Bot. Zh. Vol 29, No 1, p 42-48, 1972, Illus. (English summary).

Identifiers: Alder, *Bogs, Economics, Equisetum, Forest steppe, Reed, Rush, Sedge, Sphagnum, Steppe, *Stratigraphy, *USSR (Upland), *Vegetation, Willow.

Peat-bog region of the Eastern Forest-Steppe is located on the southwestern spurs of the Central USSR Upland. Boginess of this region is the least of all the forest-steppe regions in the Ukraine and accounts for about 0.5% of the territory. The bogs are backwater, confined to the flood plains of numerous small rivers. There are also ravine and sometimes Sphagnum eutrophic bogs in depressions on pine-forest terraces. Natural plant cover of bogs is presented by eutrophic groupings where the formations of European alder and grey willow predominate. The formations of herbaceous groupings, reed, Equisetum, rushy and some sedge species, are less distributed. Bog vegetation is strongly disturbed as a result of economic activity. The greatest part in peat structure is taken by alder-reed, swamp-forest, and multilayer-swamp types of peat deposits. Reed-alder/alder type of deposits is rare. In the peat deposits, the alder-reed and reed types of peat predominate which are distinguishable for their high ash content. In more than half the samples analyzed, ash control is above 40%. By the decomposition degree, the peats are average-to-well-decomposed. The bogs of the eastern forest-steppe appeared as a result of bogging of flood plain alder forests and basins. The bogs of this region with respect to genesis, plant, cover, peat deposits properties and geomorphological types are close to those in the neighboring regions of the Central USSR Upland.—Copyright 1973, Biological Abstracts, Inc.

W74-01096

EFFECT OF DEPTH OF SOIL CULTIVATION AND OF FERTILIZERS ON THE SURVIVAL AND GROWTH OF PINE ON THE LOWER DNIPEL SANDS, (IN RUSSIAN),

T. T. Govorova.

Lesovod Agrolesomelior Resp Mezhved Temat Nauchn St. 20, p 96-102, 1970.

Identifiers: Fertilizers, Growth, Moisture, Peat, *Pine, Pinus-Nigra-Caramanica, Sands, *Soil cultivation, *USSR (Dnieper RIVER).

The effect of depth of soil cultivation and peat application as fertilizer on the survival and growth of Pinus nigra caramanica plantations on hillocky Lower Dnieper sands was studied over an 11-year period. The plantations were established with holes of 50 x 50 cm, with 5 variants as regards depth of soil cultivation: 150, 100, 70, 50 and 30 cm, and with the application of peat and without it. Eight to 10 kg of peat per plot was put at the bottom of the holes in a 10-cm layer. Survival rate of pine in the year of planting (by May 15) in all the variants of the trial was quite high (93-100%); 74-88% in Oct. With the increase of the depth of loosening the rate of pine survival increased. Data are presented on the development of root systems and soil moisture in relation to the depth of soil cultivation. With equal soil cultivation, peat im-

proves the growth and the general condition of plantings during the first 2-3 yr, later the differences in growth level out. The use of peat is a shortterm measure; it is dried out as early as within one growing season during the year of planting. The positive effect of the depth of soil preparation on pine growth is traced in the plantations up to the age of 11 yr.—Copyright 1973, Biological Abstracts, Inc.

W74-01098

MOISTURE EXPENDITURE BY FOREST AND FIELDS IN THE PROTECTIVE AFFORESTATION REGIONS, (IN RUSSIAN),

For primary bibliographic entry see Field 03F.
W74-01099

4B. Groundwater Management

PERMEABILITY RESTORATION IN UNDERGROUND DISPOSAL RESERVOIRS,
Alabama Univ., University. Natural Resources Center.

For primary bibliographic entry see Field 05E.
W74-00554

THE USE OF GROUNDWATER IN MINNESOTA,

Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.
R. D. Harnack.

In: Proceedings of Conference on Toward A State-wide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 30-34, February 1973. 3 tab. 14-31-0001-3823.

Descriptors: *Water resources development, *Groundwater, *Minnesota, Water utilization, Irrigation water, Domestic water, Water supply, Water quality, Hydrologic data, Data collections.

The use of groundwater in Minnesota has increased during the past 5 years, especially in the areas of rural domestic use and irrigation. At present there is very little regulation as to the use of groundwater in Minnesota. In many parts of the State groundwater shortages are due to the lack of information on, rather than the actual paucity of the resource. Where information is available, there is indication that the groundwater resource is relatively undeveloped. This can be illustrated by the example of the Twin Cities artesian basin. It is estimated that this basin could safely yield about 600-700 mgpd. Present withdrawal is about 136 mgpd. Reluctance to develop this groundwater source has been due to improper analysis of data available. With the increased use of groundwater in rural areas more information and data must be obtained to provide for proper analysis of the resource. (See also W73-09113) (Knapp-USGS)
W74-00568

A REPORT OF PROGRESS AND CONCLUSIONS, (WASHINGTON, D.C. METROPOLITAN AREA WATER RESOURCES).

Washington Area Interstate Water Resources Program, D.C.

For primary bibliographic entry see Field 06D.
W74-00583

EL PASO'S WATER RESOURCES,

El Paso Water Utilities, Tex.

For primary bibliographic entry see Field 06D.
W74-00740

PRESENT AND FUTURE WATER USE AND ITS EFFECT ON PLANNING IN MARICOPA COUNTY, ARIZONA,
For primary bibliographic entry see Field 03D.
W74-00754

GROUNDWATER SURVEY OF THE ERBIL PROJECT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).

R. H. Haddad.
Technical Bulletin 50. May 1973. 28 p, 13 fig, 2 tab, 5 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Surveys, *Water chemistry, Aquifers, Exploration, Hydrogeology, Testing, Water levels, Geophysics.
Identifiers: *Iraq.

Carried out under a UNDP-UNESCO project, a groundwater survey of the Erbil Project area is part of the pre-project activity of a UNDP-FAO investigation. This reconnaissance stage is restricted to an inventory of information, and the collection, chemical analysis, and interpretation of groundwater samples of the area. The area is well endowed with good aquifers containing water of a quality generally suitable for irrigation and drinking. Recommendations include aquifer testing of existing pumped wells, water level observations (to be increased to weekly tests for a period of at least 6 months/year), estimates of present rates of withdrawal, discharge, and recharge, and finally, geo-electric prospecting. Information is given on the environment generally, including geology, climate, geomorphology, hydrogeology, and hydrochemistry of the area, with tables displaying the chemical analyses and classification of existing groundwater. (Paylore-Arizona)
W74-00761

BIBLIOGRAPHY OF REPORTS ON THE WATER RESOURCES OF INDIANA PREPARED BY THE U.S. GEOLOGICAL SURVEY, 1886-1972,

Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 02E.
W74-00814

GROUNDWATER RESOURCES OF THE USSR (RESURSY PODZEMNYKH VOD SSSR),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 02F.
W74-00845

PATTERNS OF LONG-TERM NATURAL FLUCTUATIONS OF GROUNDWATER LEVELS (ZAKONOMERNOSTI MNOGOLETNIKH YESTESTVENNYKH KOLEBANIY UROVNEY PODZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 02F.
W74-00846

POSSIBILITIES OF USING GEOPHYSICAL METHODS IN A STUDY OF FRESHWATER DISCHARGES IN LITTORAL ZONES OF SEAS (O VOZMOZHNOSTY VZGLADENIY PREDSTVYAKH GEOFIZICHESKIMI METODOV PRI IZUCHENII RAZGRUZOK PRESNYKH VOD V PРИБРЕЖНЫХ ZONAKH MOREY),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02F.
W74-00847

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Effects on Water of Man's Non-Water Activities—Group 4C

AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,
Eastern New Mexico Univ., Portales.
For primary bibliographic entry see Field 05B.
W74-00850

METHODS OF COLLECTING AND INTERPRETING GROUND-WATER DATA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W74-00929

MODIFIED SOLUTIONS FOR DECREASING DISCHARGE WELLS,
California Univ., Davis, Dept. of Irrigation.
For primary bibliographic entry see Field 08B.
W74-00932

MECHANISM OF FLOW AND CONTROLLED DISSOLUTION OF SALT IN SOLUTION MINING,
Texas Univ., Austin.
For primary bibliographic entry see Field 08B.
W74-00934

GROUND WATER POLLUTION AND CONSERVATION,
C. K. Lewicke.
Environmental Science and Technology, Vol 6, No 3, p 213, 215, March, 1972.

Descriptors: Water sources, Water resources, Water supply, *Water law, *Water conservation, Hydrology, *Aquifer characteristics, *Groundwater pollution, *Groundwater management.

Identifiers: Zone of saturation, Zone of aeration.

A brief review of ground water, its occurrence, properties, advantages and problems is presented. The nature of ground water occurrence, movement and recharge is discussed. The importance of groundwater as a contributor to surface sources; as municipal and individual water sources; and the results of improper use of these ground water sources is discussed. The factors leading to ground water pollution and their short and long-term effects are discussed. The current efforts in ground water regulation in the areas of withdrawal and protection from contamination are described. (Campbell-NWWA)

W74-00938

PULSE TESTING: A NEW METHOD FOR DESCRIBING RESERVOIR FLOW PROPERTIES BETWEEN WELLS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 08G.
W74-00939

HOW TO FIND ABANDONED OIL AND GAS WELLS,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 08G.
W74-00941

MAXIMIZING WATER YIELD THROUGH WELL DEVELOPMENT—TECHNICAL MEMO NO. 2,
For primary bibliographic entry see Field 08B.
W74-00943

DETECTION AND ESTIMATION OF DEAD-END PORE VOLUME IN RESERVOIR ROCK BY CONVENTIONAL LABORATORY TESTS,
California Univ., Berkley.
For primary bibliographic entry see Field 08G.
W74-00944

BOREHOLE LOGGING INVESTIGATIONS IN THE CHALK OF THE LAMBOURN AND WINTERBOURNE VALLEYS OF BERKSHIRE,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 08G.
W74-00956

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART I NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 06D.
W74-01040

SEEPAGE FLOWS—FIELD DATA MEASUREMENTS FOR EVALUATION OF POTENTIAL CONTRIBUTION OF FERTILIZERS TO GROUNDWATER POLLUTION,
Rutgers - The State Univ., New Brunswick, N.J.
Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W74-01054

4C. Effects on Water of Man's Non-Water Activities

SALTS IN IRRIGATION DRAINAGE WATERS: I. EFFECTS OF IRRIGATION WATER COMPOSITION, LEACHING FRACTION, AND TIME YEAR ON THE SALT COMPOSITIONS OF IRRIGATION DRAINAGE WATERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Rhoades, R. D. Ingvalson, J. M. Tucker, and M. Clark.
Soil Science Society of America Proceedings, Vol 37, No 5, p 770-774, September-October 1973. 6 tab, 13 ref.

Descriptors: *Leaching, *Return flow, *Water pollution sources, Lysimeters, Water quality, Water chemistry, Salts, Alfalfa, Irrigation practices, Soil chemistry.

The compositions of percolated drainage waters resulting from the use of eight synthetic river waters of the Western USA under alfalfa production in a controlled lysimeter experiment were studied. The compositions are affected by the composition of a river water used for irrigation, the fraction of applied water that appeared as drainage water, the presence or absence of soil CaCO_3 , whether or not the drainage water is open to the atmosphere, and the time of year. (Knapp-USGS) W74-00609

SIMULATING EFFECTS OF HARVEST CUTTING ON SNOWMELT IN COLORADO SUBALPINE FOREST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. C. F. Leaf, and G. E. Brink.
National Symposium on Watersheds in Transition, June 19-22, 1972, Fort Collins, Colo, p 191-196. 7 fig, 2 tab, 33 ref.

Descriptors: Computers, Computer models, Coniferous forests, *Forest management, Model studies, Mountain forests, Simulation analysis, *Snowmelt, Vegetation effects, Watershed management, *Colorado, *Cutting management.

A recently developed dynamic model has produced tentative results regarding the probable effects of timber harvesting on snowmelt in a central Colorado subalpine watershed. Snowmelt rates in mature lodgepole pine and Engelmann spruce forest were compared against a hypothetical pattern of 5 tree-height diameter openings, cut into the watershed so that trees on 40 percent of the area were removed. The average effect for the

8 years simulated was to increase melt rates early in the melt season and diminish snowmelt later. Although harvest cutting affected timing by causing the bulk of the snowmelt to occur earlier, the duration of the snowmelt season was apparently not significantly changed. Early-season snowmelt was accelerated in the small openings, but in both natural forest and cut-over areas, the last snow melted at about the same time. (Forest Service) W74-00686

SOILS AND WATER,
Forest Service (USDA), Asheville, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W74-00698

ENGINEERING REPORT ON SPECIAL ASSESSMENT STORM SEWER DISTRICT FOR THE NORTHEAST INDUSTRIAL DISTRICT, CITY OF KANSAS CITY, MISSOURI.
Riddle Engineering, Inc., Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W74-00802

PRELIMINARY STUDY FOR CENTRAL INDUSTRIAL DISTRICT SEWERS, DEPARTMENT OF PUBLIC WORKS, KANSAS CITY, MISSOURI.
Shafer, Kline and Warren, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W74-00803

FLOOD STUDIES FOR SAFETY OF TVA NUCLEAR PLANTS: HYDROLOGIC AND EMBANKMENT BREACHING ANALYSIS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 08A.
W74-00805

LONE PEAK WILDERNESS AREA, UTAH, AND DESIGNATING A SEGMENT OF THE COLORADO RIVER IN UTAH AS PART OF THE WILD AND SCENIC RIVERS SYSTEM.

Hearing—Subcomm. on Public Lands—Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, July 7, 1972. 134 p, 2 fig, 2 map, 4 photo, 4 tab.

Descriptors: United States, *Colorado River, *Utah, *Legislation, *National forests, *Administration, Regulation, Wild River Act, Recreation, Scenery, Water policy.
Identifiers: *Lone Peak Wilderness Area (Utah).

The first bill discussed, S.2901, would amend the Wild and Scenic Rivers Act by designating a segment of the Colorado River in the State of Utah as a component of the National Wild and Scenic Rivers System. The second bill, S.3466, would authorize the Secretary of Agriculture to review as to its suitability for preservation as wilderness the area commonly known as the Lone Peak Area in Utah. The area involved is approximately 13,000 acres within the Wasatch and Uinta National Forests. The Lone Peak Area is not classified as a national forest primitive area but is included among the areas the Forest Service is now considering for inclusion in the national wilderness preservation system. S.3466 would designate the Lone Peak a wilderness before completion of an intensive study and review process similar to that applicable to national forest primitive areas. For this and other reasons many of the witnesses appearing before the subcommittee indicated that such a review should be accomplished before the Lone Peak area be designated as wilderness. (Mockler-Florida)
W74-00874

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C—Effects on Water of Man's Non-Water Activities

SOUTHERN CALIFORNIA'S DETERIORATING MARINE ENVIRONMENT, AN EVALUATION OF THE HEALTH OF THE BENTHIC MARINE BIOTA OF VENTURA, LOS ANGELES AND ORANGE COUNTIES.
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 05C.
W74-00877

4D. Watershed Protection

SUBURBAN AMERICA: POPULATION DYNAMICS AS RELATED TO WATER RESOURCES PLANNING,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W74-00553

SOILS AND WATER,
Forest Service (USDA), Asheville, N.C.
Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W74-00698

PRICKETT CREEK WATERSHED, WEST VIRGINIA (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W74-00860

LOST CREEK WATERSHED, NEWTON COUNTY, MISSOURI (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-MO-73-0098-F \$4.25 in paper copy, \$1.45 in microfiche. January 1973. 40 p, 1 map, 1 tab.

Descriptors: *Missouri, *Environmental effects, *Watershed development, Flood control, Recreation, Land use, Dams, Flood prevention, Flood plain development, Agriculture, Wildlife habitat, Parks, Ecology.
Identifiers: *Environmental Impact Statements, *National Environmental Policy Act, *Newton Co., Mo.

The project consists of land treatment measures, seven floodwater retarding dams, and three debris basins. Flood damage to 1,877 acres of agricultural lands will be reduced and peak flows from the 100-year storm will be reduced 37 percent. Seneca Sediment yield will be reduced 25 percent. The installation of the project will change the land use of areas needed for dams, spillways, and to store sediment, and, as a result, the intensification of agriculture in the flood plain is expected to reduce wildlife cover. Alternatives to the proposed project include land treatment only; increasing the capacity and efficiency of the channel; relocating damageable values and providing zoning; construction of levees; and developing flood-prone lands for purposes little affected by flooding such as parks, tree farms, or wildlife areas. The Lost Creek Watershed project is located in Newton County, Southwest Missouri, and contains 39,100 acres or approximately 61 square miles within the Arkansas River Basin, and flows into the Grand Lake of the Cherokees. (Mockler-Florida)
W74-00880

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY--PROCESSES AND RESOURCES, VOLUME I.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00890

EFFECT OF THE POLYMER K-4 ON THE RESISTANCE OF LIGHT CHESTNUT SOIL COVER TO EROSION BY WATER, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics.
Y. Ya. Grigor'ev.
Vestn. Mosk. Univ. Ser 6 Biol Pochvoved. Vol 27, No 3, p 98-101. 1972. Illus. (English summary).
Identifiers: *Erosion control, *Polymer K-4, Resistance, *Soil cover, Soil treatment.

The optimum concentration of polymer K-4 for the soils is 0.025-0.1%. Such doses prevent erosion of clay and loam soils by the bottom speed of the stream (V delta) 30-40 cm/sec and of sandy-loam soils by the bottom speed of the stream (V delta) 19-25 cm/sec. Copyright 1973, Biological Abstracts, Inc.
W74-00988

5. WATER QUALITY MANAGEMENT AND PROTECTION

HYDROCARBON INCORPORATION INTO THE SALT MARSH ECOSYSTEM FROM THE WEST FALMOUTH OIL SPILL,
Woods Hole Oceanographic Institution, Mass.
K. A. Burns, and J. M. Teal.
Available from NTIS, Springfield, Va., 22151 as COM-73-10419 Price \$3.00 printed copy; \$1.45 microfiche. Report, Reference No. 71-69, November 1971. 24 p, 31 fig, 1 tab, 5 ref. Grant 14-17-007-1128 (BCF). Grant GA-28365 (NSF).

Descriptors: *Water pollution sources, *Oil spills, *Bays, *Massachusetts, Environmental effects, Ecosystems, Path of pollutants, Marshes, Sampling, Chemical analysis, Organic compounds, Cores, Mud, Marsh plants, Bottom fish, Data collections, Evaluation, Ecology.
Identifiers: *Buzzards Bay (Mass), *Wild Harbor Marsh (Mass), Hydrocarbons.

The oil barge 'Florida' ran aground just off Little Island, West Falmouth, Massachusetts on September 16, 1969. About 175,000 gallons of Number Two fuel oil leaked into Buzzards Bay and the adjacent Wild Harbor Marsh. Samples of marsh muds and organisms collected nearly a year after the spill were analyzed for movement of polluting hydrocarbons through the marsh ecosystem. The dead areas were the most heavily polluted. A deep mud core in the dead area showed oil has penetrated to at least 70 cm. Virtually all the marsh organisms living in the contaminated area were affected by the oil at least to the extent that they accumulated oil hydrocarbons in their tissues. Two processes may occur as the oil passes through the marsh ecosystem. There may be a progressive loss in the straight chain hydrocarbons in relation to branched chain, cyclic and aromatic hydrocarbons. There also appears to be a selection for the higher boiling fractions of the contaminants higher up in the food chain. (Woodard-USGS)
W74-00824

5A. Identification of Pollutants

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 10 GENERA OF FRESHWATER NEMATODES (NEMATODA) OF EASTERN NORTH AMERICA, Purdue Univ., Lafayette, Ind. Dept. of Entomology.
For primary bibliographic entry see Field 02I.
W74-00563

BIOTA OF FRESHWATER ECOSYSTEMS IDENTIFICATION MANUAL NO. 11 FRESHWATER UNIONACEAN CLAMS (MOLUSCA:PELECYPODA) OF NORTH AMERICA, Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 02A.

W74-00564

REMOTE SAMPLER FOR DETERMINING RESIDUAL OIL CONTENTS OF SURFACE WATERS,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 05G.
W74-00584

RECOVERY OF BACTERIOPHAGE FROM CONTAMINATED CHILLED AND FROZEN SAMPLES OF EDIBLE WEST COAST CRABS, Notre Dame Coll., Belmont, Calif. Dept. of Biology.

R. DiGirolamo, and M. Daley.
Applied Microbiology, Vol 25, No 6, p 1020-1022, June 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Bacteriophage, *Crabs, *Storage, *Temperature, Viruses, Crustaceans, Shelffish, E. coli, Freezing, Assay, Pollutant identification, Pollutants.

Identifiers: *Cancer magister, *Cancer antennarius, Recovery, Survival, Coliphage T4, Escherichia coli B, Enteroviruses.

Edible West Coast crabs (Cancer magister and C. antennarius) were contaminated with bacteriophage and then held in a chilled or frozen state. Two separate series of experiments were carried out whereby the crabs were, respectively, exposed to 50,000 and 46,000 phage plaque-forming units (PFU) per ml of seawater for 24 h. The results of the chilling experiments which used contaminated unprocessed and processed boiled crabs exhibited a gradual decrease in virus titer in all samples during the entire test period. After 120 h, however, 7000 virus PFU/g were still recovered from the unprocessed crabs and 45 virus PFU/g from processed samples. The freezing studies also showed a gradual decrease in virus titer during the entire experimental period. After 20 days of storage 15,000 virus PFU/g from the frozen unprocessed crabs and 140 virus PFU/g from the processed samples were recovered. This represents survival or recovery rates of approximately 42 and 55 percent, respectively. At the end of the study (30 days), 12,000 virus PFU per g were still found to be present in the unprocessed samples, and 45 PFU per g were recovered from the processed samples. (Holoman-Battelle)
W74-00613

DIFFERENTIAL COUNTING IN MIXED CULTURES WITH COULTER COUNTERS, Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
J. F. Drake, and H. M. Tsuchiya.
Applied Microbiology, Vol 26, No 1, p 9-13, July 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Microorganisms, Microscopy, Estimating, Reliability, Size, Methodology, Bacteria, E. coli, Yeasts, Fungi, Protozoa, Viability, *Cultures.

Identifiers: *Mixed cultures, *Coulter counter, *Differential counting, Lactobacillus casei, *Bacillus licheniformis*, *Saccharomyces cerevisiae*, *Dicotyostelium discoideum*, *Azotobacter vinelandii*, *Tetrahymena pyriformis*, *Colpoda*, Hemacytometer, Viable count.

A critical comparison of Coulter, viable, and microscope counts for several mixed cultures of microorganisms has been made. This investigation shows that Coulter counting can provide reliable estimates of microbial numbers in mixed cultures. Precautions and limitations of Coulter counting in mixed cultures are discussed. (Holoman-Battelle)
W74-00614

SOME OBSERVATIONS ON THE INCORPORATION OF NOVOBIOCIN INTO HEKTOEN EN-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

TERIC AGAR FOR IMPROVED SALMONELLA ISOLATION,
Campbell Inst. for Food Research, Camden, N.J.
D. A. Hoben, D. H. Ashton, and A. C. Peterson.
Applied Microbiology, Vol 26, No 1, p 126-127,
July 1973. 1 tab, 3 ref.

Descriptors: *Isolation, *Salmonella, *Antibiotics (Pesticides), *Pollutant identification, Inhibition, Bactericides, Selectivity, Enteric bacteria, *E. coli*.
Identifiers: *Novobiocin, *Hektoen enteric agar, Culture media, Selective media, *Salmonella* cubana, Serotypes, *Salmonella* seftenberg, *Salmonella* typhimurium, *Salmonella* urbana, *Salmonella* montevideo, *Salmonella* wohington, *Citrobacter freundii*, *Proteus mirabilis*, *Proteus morganii*, *Citrobacter diversus*.

A preliminary study was conducted to determine whether the selectivity of Hektoen enteric agar (HEA) for *Salmonella* isolation could be improved by the incorporation of an appropriate concentration of novobiocin. Pure cultures of salmonellae and related organisms were used. Broth cultures were surface plated in quadruplicate at 2 different concentrations. HEA plates were incubated at 37°C for 18-20 h prior to counting. When novobiocin at 5 or 10 micrograms/ml was incorporated into HEA, the *Proteus* and *Citrobacter* varieties employed in this study were inhibited. The *E. coli* varieties used presented no problems, because they produced salmon-colored colonies; however, the growth of most strains tested appeared reduced at these concentrations of antibiotic. Ten serotypes of *Salmonella* grew without any apparent inhibitory effects when novobiocin was used at 2, 5, 10, and 15 micrograms/ml in the HEA. At 20 micrograms of antibiotic per ml of agar, *Salmonella* grew, but at a much slower rate and without the production of the typical black-centered colonies. Novobiocin was stable at concentrations up to 20 micrograms/ml in HEA. Agar plates containing novobiocin stored for several weeks at 22°C gave similar inhibitory results to freshly prepared plates with the nonsalmonellae. (Holoman-Battelle)
W74-00617

BACTERIAL ENDOTOXINS IN THE ENVIRONMENT,
Tulane Univ., New Orleans, La. Dept. of Physiology.
For primary bibliographic entry see Field 05B.
W74-00618

IDENTIFICATION AND CHARACTERIZATION OF THE MICROFLORA AND SPOILAGE BACTERIA IN FRESHWATER CRAYFISH PROCAMBARUS CLARKII (GIRAD),
Louisiana State Univ., Baton Rouge. Dept. of Food Science.

N. A. Cox, and R. T. Lovell.
Journal of Food Science, Vol 38, No 4, p 679-681, May/June 1973. 5 tab, 12 ref.

Descriptors: *Cultures, *Crayfish, *Food processing industry, *Separation techniques, *Pseudomonas, Pollutant identification.
Identifiers: Spoilage, *Achromobacter, Culture media, Sample preparation, Alcaligenes, Micrococcus, Flavobacterium, Aerobacter, Bacillus, Lactobacillus, Sarcina, *Proteus*, *Procamburus clarkii*, *Staphylococcus*.

Unwashed peeled tail meat of freshwater crayfish (*Procamburus clarkii*) was collected from processing lines, stored up to 24 days at 0°C and 5°C, and analyzed for spoilage bacteria. Samples were homogenized in a blender, diluted with a phosphate buffer, and cultured with Milk-Protein Hydrolysate. A total of 280 isolated colonies were randomly picked and generically identified. These cultures were inoculated into sterile crayfish substrate for evaluation of their ability to produce spoilage. Spoilage occurred when counts reached 1 billion per gram. Eleven different genera were

found in the 280 isolates; three genera, *Achromobacter*, *Alcaligenes*, and *Pseudomonas* comprised approximately 82 percent of the isolates. *Micrococcus*, *Staphylococcus*, and *Alcaligenes* made up the major portion of the bacterial flora in fresh tail meat whereas *Pseudomonas* and *Achromobacter* predominated in the spoiled product. Classification of the bacteria according to spoilage rate showed *Pseudomonas* to predominate with *Achromobacter* a distant second. These two bacteria are concluded to be the predominant psychrophilic spoilage organisms in commercial crayfish tail meat. (Little-Battelle)
W74-00620

FATTY ACID COMPOSITION OF L-FORMS OF STREPTOCOCCUS FAECALIS CULTURED AT DIFFERENT OSMOLALITIES,
Veterans Administration Hospital-Wadsworth, Los Angeles, Calif. Research and Medical Service. J. Z. Montgomerie, G. M. Kalmanson, and L. B. Guze.
Journal of Bacteriology, Vol 115, No 1, p 73-75, July 1973. 1 tab, 10 ref.

Descriptors: *Cultures, *Pollutant identification, Cytological studies, Organic acids, Chemical analysis, Aerobic bacteria, Lipids.
Identifiers: **Streptococcus faecalis*. *Fatty acids, Chemical composition, *Osmotic pressure, Chemotaxonomy, Flame ionization gas chromatography, Culture media.

The fatty acid composition of the membranes of three different penicillin-produced L-forms of *Streptococcus faecalis* was determined: (1) a stable (nonreverting) L-form (T53) cultured in brain heart infusion (BHI) with 0.5 M sucrose; (2) a stable L-form (T531) cultured in BHI without sucrose; and (3) an unstable L-form (T9) cultured in BHI with 0.5 M sucrose and 1,000 U of penicillin per ml. L-forms were obtained by centrifugation and lysed by washing in 1 mM tri (hydroxymethyl) aminomethane-hydrochloride buffer. The parent *S. faecalis* was also cultured in BHI and BHI containing 0.5 M sucrose, and washed with buffer. The fatty acid composition of L-forms of *S. faecalis* cultured in BHI without sucrose (370 mosmol) had higher C18:1 and lower C18 than L-forms cultured in the same media with added 0.5 M sucrose (950 mosmol) in both exponential and stationary cultures. In the stationary phase of growth, C19 was reduced in the L-forms cultured without sucrose. Similar changes were seen in the parent *S. faecalis* cultured in the two types of media. These changes in membrane fatty acids may relate to osmo-regulation of the L-forms. (Holoman-Battelle)
W74-00622

MOLECULAR RELATIONSHIPS AMONG THE SALMONELLEAE,
Walter Reed Army Inst. of Research, Washington, D.C.
For primary bibliographic entry see Field 05B.
W74-00623

FACTORS WHICH INFLUENCE THE ENUMERATION OF BDELOVIBRIO BACTERIOVORUS IN SEWAGE AND RIVER WATER,
University of Wales Inst. of Science and Tech., Cardiff.
D. G. Staples, and J. C. Fry.
Journal of Applied Bacteriology, Vol 36, No 1, p 1-11, March 1973. 5 fig, 5 tab, 19 ref.

Descriptors: *Sewage, Rivers, Methodology, *Pollutant identification, Hosts, Pollutants, Natural streams, Protozoa, Bacteria, Parasitism, Centrifugation, Isolation, *E. coli*, Water sampling.
Identifiers: *Enumeration, *Pretreatment, Sample preparation, *Bdellovibrio bacteriovorus, Double layer plating technique, Culture media,

Escherichia coli B, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Escherichia coli* K12, *Aerobacter aerogenes*, *Serratia marcescens*, *Pseudomonas fluorescens*, *Arthrobacter ureofasciens*, *Achromobacter*, Membrane filters, Homogenization, *Lactobacillus plantarum*, Culturing techniques.

A double layer plating technique was used for counting *Bdellovibrio* bacteriovorus in river water and sewage samples. The optimum conditions for enumeration were provided by dilute media with 0.6 percent of agar as the top layer, incubated for 6 days at 30 degrees with *Achromobacter* sp. as the host. Pretreatment of samples affected counts: centrifugation and membrane filtration reduced the *bdellovibrio* count, homogenization increased it. Protozoa in sewage samples caused large plaques that greatly hindered counting and attempts to eliminate these plaques were unsuccessful. The highest counts in sewage samples averaged 900 cells/ml. (Holoman-Battelle)
W74-00624

ON THE ISOLATION OF VIRUS FROM SEWAGE TREATMENT PLANT SLUDGES,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). E. Lund, and V. Ronne.
Water Research, Vol 7, No 6, p 863-871, June 1973. 9 tab, 6 ref.

Descriptors: *Viruses, *Isolation, *Sewage sludge, *Sewage treatment, *Pollutant identification, Methodology, Municipal wastes, Biological treatment, Chemical degradation, Activated sludge, Sewage effluents, Chemical precipitation, Pollutants, Centrifugation, Lime, Cultures, Ethers.

Identifiers: Pollutant removal, *Coxsackie virus B3*, *Adenovirus 3*, *Coxsackie virus B1*, *Coxsackie virus B5*, Ferric chloride, Aluminum sulfate, *Echovirus 19*, Decontamination, Concentration.

Sludges from biological and chemical treatments of urban sewage were examined for virus. The virus isolations were made in tube cultures of HeLa cells. The cells were grown in a medium consisting of 7 percent calf serum in Hanks' solution to which 0.5 percent lactalbumin hydrolysate and antibiotics were added. The tubes contained 2 ml of medium, and the inoculum was 0.1 ml. Each sample was inoculated in 4 tubes. Blind passages were carried out twice from each negative culture, each time after an incubation period of 7 days at 37°C. No isolation was considered positive before typing by neutralization was made. Virus was found bound to particles and was not eluted at pH 9.0 in the samples from activated sludge treatment. The secondary sludge contained less virus than the primary sludge. The isolated virus type were *Coxsackie B* strains, *ECHO* strains and *Adenovirus* strains. Treatment with lime, ferric chloride and aluminum sulfate in experimental scale removed virus from raw sewage so that virus could be demonstrated in the sludge from sewage where virus was not demonstrated. No virus inactivation in the chemical sludges were observed. (Holoman-Battelle)
W74-00628

THE EFFECT OF PRETREATMENTS ON THE VIRUS CONTENTS OF SEWAGE SAMPLES,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). E. Lund.
Water Research, Vol 7, No 6, p 873-879, June 1973. 3 tab, 7 ref.

Descriptors: *Viruses, *Isolation, *Pollutant identification, Methodology, *Activated sludge, *Sewage sludge, Biological treatment, Centrifugation, Sewage, Pollutants, Ethers, Cultures, Domestic wastes, Industrial wastes, Sewage effluents, Storage, Influentes.

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Identifiers: *Sample preparation, Concentration, Recovery, Coxsackie virus B3, Adenovirus 3, Adenovirus 2, Adenovirus 1, Adenovirus 5, Coxsackie virus B5.

Experiments were conducted to determine the effect of pretreatments (low speed centrifugation, decontamination and 2-phase concentration) of sewage and sludge samples on the recovery of virus from such samples. Five-liter dip samples were collected from two biological treatment plants and the virus isolations were made in tube cultures of HeLa cells. The cells were kept in a medium consisting of 7 percent calf serum in Hanks' solution of which 0.5 percent lactalbumin hydrolysate and antibiotics were added. Each sample was inoculated in 4 tubes using 0.1 ml inocula. The adsorption period was kept at 2 h as a compromise because sludge samples could not safely be allowed longer contact time. Blind passages were carried out twice from each negative or suspected culture; each time an incubation period of 7 days at 37°C was employed. No isolation was considered positive before typing by neutralization was successfully carried out. By isolations of virus from sewage and sludge samples, which had been fractionated by centrifugation at 9000 rev/min, it was found that virus may be particle bound and recoverable in the precipitates. An exception was the secondary sludge of the activated sludge treatment. It was thus indicated that removal of a part of a sewage or sludge sample before examination may make true quantitative estimations impossible. Re-examination of samples after storage at -20°C for 6 months gave remarkably poor virus recoveries. (Holoman-Battelle)

W74-00629

LOW-COST FACILITIES FOR THE BACTERIOLOGICAL EXAMINATION OF DRINKING WATER SAMPLES,
Nairobi Univ. (Kenya). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.

W74-00630

ALTERNATING CURRENT POLAROGRAPHY IN THE HARMONIC MULTIPLEX MODE. OBSERVATIONS ON THE USE OF DIGITAL SIGNAL CONDITIONING WITH THE FAST FOURIER TRANSFORM ALGORITHM,
Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
For primary bibliographic entry see Field 07C.

W74-00631

POLAROGRAPHIC STUDY OF CALOMEL ELECTRODE IN ANHYDROUS FORMIC ACID,
Quebec Univ., Rimouski (Quebec). Dept. of Pure Sciences.
For primary bibliographic entry see Field 02K.

W74-00633

SPINNING DROPPING MERCURY ELECTRODE-A PRACTICAL ANALYTICAL TOOL,
Saint John's Univ., Jamaica, N. Y. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.

W74-00634

AN AMMONIUM ION-SPECIFIC ELECTRODE,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 02K.

W74-00636

ELECTROCHEMICAL STUDY OF A HETEROGENEOUS COPPER (II)-SELECTIVE ELECTRODE: STUDY OF SELECTIVITY AND POTENTIAL STABILITY,
Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K.

W74-00637

REMOTE SENSING OF OIL SLICKS,
S. Axelsson, and E. Ohlson.

AMBIO, Vol 2, No 3, p 70-76, 1973. 6 fig, 14 ref.

Descriptors: *Oil spills, *Remote sensing, *Pollutant identification, *Environmental effects, *Oil pollution, Aerial photography, Mapping, Thin films, Wind velocity, Films, Water quality, Cloud cover, Sea water, Solar radiation, Water pollution, Pollutants, Photogrammetry.

Identifiers: *Data interpretation, Accuracy, Microwave sensors, Crude oil, Fuel oil, Thermal infrared imagery, Infrared imagery, Marine environment.

The frequent marine oil spills point out the need for effective methods of oil slick detection and surveillance. The most efficient means for localizing a spill and measuring its extent is the use of airborne remote sensing systems. The fundamental relation between the remote sensing signal and oil slick characteristics is investigated. The discussion is based upon results from a study for the Swedish Board for Technical Development. Due to differences between the material properties of oil and water, an oil slick is detectable in most wavelength bands. The capability of mapping thin oil slicks varies with the wavelength used. The amount of cloud cover also has a great influence on the contrast and the optimum wavelength band for mapping. A significant relation also exists between the contrast and the thickness of the oil film in some parts of the spectrum, particularly in the green band, thermal infrared (IR) and the microwave region. The multiband signature is also related to the oil type. The main interpretation problem is that the oil signature is also influenced by environmental parameters like amount of cloud cover, sea state, wind speed, water quality, and attenuation and scattering of the atmosphere. The accuracy of the interpretation is highly improved if information about these parameters is available. Particularly the thickness mapping can be performed more efficiently if it is possible to calibrate the interpretation model by thickness values from a few points of the slick. The quality of the extracted data about the oil slick is also enhanced if information from different wavelength bands is combined. If microwave sensors are included, the system can also operate during all weather conditions. (Holoman-Battelle)

W74-00638

SAMPLING FOR WASTE WATER ANALYZERS. PART I: SYSTEMATIC APPROACH,
Union Carbide Corp., South Charleston, W. Va.

J. W. Sugar, and J. H. Brubaker.
Instrumentation Technology, Vol 20, No 6, p 27-32, June 1973. 6 fig.

Descriptors: *Water sampling, *Instrumentation, Methodology, *Water water (Pollution), *Planning, Water pollution, Water pollution sources, Pollutants, Measurement, Monitoring, Water analysis, Mechanical equipment, Interfaces, Effluents, Streams, Reliability.

Identifiers: *Waste water analyzers, *Sampling equipment, Sample preparation.

A systematic approach to the design of a sampling conditioning system has been suggested for improving the reliability of such a system. Poor instrument reliability is caused primarily by the fouling of the sampling system or malfunction of the analyzer components that are continuously exposed to the polluted samples. Assuming that the correct analyzer has been chosen for a given application, there are 8 aspects of sampling that require in-depth consideration if a functional support package for the instrument is to be assembled. These 8 areas are: measurement objective, sample point, sample probe, pumping system, transfer lines, sample conditioning, analyzer interface

(stream selection), and analyzers. (See also W74-00643) (Holoman-Battelle)

W74-00642

SAMPLING FOR WASTE WATER ANALYZERS. PART II: EFFECTIVE APPLICATIONS,
Union Carbide Corp., South Charleston, W. Va.

J. W. Sugar, and J. H. Brubaker.
Instrumentation Technology, Vol 20, No 8, p 39-43, August 1973. 7 fig.

Descriptors: *Water sampling, *Instrumentation, *Prototypes, Waste water (Pollution), Mechanical equipment, On-site tests, Sewers, Prototype tests, Water pollution, On-site data collections, Waste dilution, Interfaces, Water analysis, Pumps, Pumping, Reliability.

Identifiers: *Waste water analyzers, *Stream sample conditioner, *Sampling equipment, Sample preparation, Sample dilution.

A prototype hardware package is described which has been used to verify the sample conditioning system design and conditioning philosophy which were developed in Part I of the study. The portable sample conditioner equipped with a conditioner package which was built for mobility and versatility has been used in field tests. Every function deemed necessary in obtaining the selected conditioning goals can be evaluated with this portable unit. It can handle pressurized sewers, as well as unpressurized ones. Pumps can be interchanged to get the desired lift and head; sample dilution can be performed with clean water at ratios ranging from 2:1 to 30:1. Ratios above 30:1 are possible but uncommon. The sample can be depressurized and repressurized. The unit is also equipped to evaluate the performance of those components in a total carbon analyzer that are in intimate contact with the sample (e.g., sample inject valve, reaction chamber, catalyst and associated components). An infrared analyzer can be connected to the reactor if desired. With this system, alterations can be made in philosophy to correct for poor historical data, lack of experience on a particular type of stream, or simply an incorrect choice of hardware. This prototype can now be loaned to a plant or individual unit for approximately 500-1,000 dollars per application. A 1,000 dollar field test is a good investment when plans are being formulated to install a 30,000 dollar measurement system. This price includes typical costs for a concrete pad, building, heating, plumbing, sample conditioner, and analyzer. Some of the more typical applications such as solids removal and sample dilution are reviewed in some detail. (See also W74-00642) (Holoman-Battelle)

W74-00643

BIODEGRADATION OF NITRILOTRIACETATE (NTA) BY BACTERIA-I. ISOLATION OF BACTERIA ABLE TO GROW ANAEROBICALLY WITH NTA AS A SOLE CARBON SOURCE,
Karolinska Institutet, Stockholm (Sweden). Dept. of Applied Microbiology.

S-O. Enfors, and N. Molin.
Water Research, Vol 7, No 6, p 881-888, June 1973. 3 fig, 4 tab, 17 ref.

Descriptors: *Microbial degradation, *Nitrilotriacetic acid, *Anaerobic conditions, *Isolation, *Aerobic conditions, *Anaerobic bacteria, Aquatic bacteria, Biodegradation, Nutrients, Cultures, Metabolism, Water pollution.

Identifiers: Substrate utilization, Fate of pollutants, Culture media, Enrichment, Characterization, Biochemical characteristics, Bacterial physiology.

An investigation was conducted to determine if bacteria exist that are capable of degrading NTA in oxygen-depleted environments. Mud samples taken from the bottom of sewage contaminated

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shallow waters were shaken with water from the collection site and filtered through paper under vacuum. The filtrate was used to inoculate the culture media that were used; a trace element solution containing Zn, Cu, Mn, and Co was also added to these media. Strains of bacteria that were able to utilize nitrilotriacetate under aerobic and anaerobic conditions were isolated from the sampled environment. One of these strains (NTA-A2) is a facultative anaerobe which grows under anaerobic conditions on NTA if nitrate is available in the medium. (Under aerobic conditions this strain can utilize acetate, glucose and some other sugars as well as NTA but not EDTA (ethylenediaminetetraacetate) or lactose as the sole carbon source. The properties and characteristics of the strain NTA-A2 are described. (See also W74-00645) (Holoman-Battelle)

W74-00644

EFFECT OF TEMPERATURE OF INCUBATION ON PERFORMANCE OF MEDIA IN THE DETECTION OF ENTERIC PATHOGENS,
East Jefferson General Hospital, Metairie, La.
W. I. Taylor, and D. Schelhart.

Applied Microbiology, Vol 25, No 6, p 940-944, June 1973. 3 tab, 12 ref.

Descriptors: *Enteric bacteria, *Pathogenic bacteria, *Aerobic bacteria, *Isolation, *Temperature, *Salmonella*, *Shigella*, Incubation, *E. coli*, Cultures, Methodology, Pollutant identification. Identifiers: *Culture media, Enrichment, Agars, Broths, *Edwardsiella tarda*, *Arizona hinshawii*, *Providencia*, *Staphylococcus aureus*, *Salmonella typhi*, *Salmonella typhimurium*, *Salmonella oranienburg*, *Salmonella infantis*, *Salmonella blockley*, *Salmonella java*, *Salmonella anatum*, *Salmonella newport*, *Salmonella thompson*, *Salmonella heidelberg*, *Salmonella manhattan*, *Salmonella mississippi*, *Salmonella montevideo*, *Salmonella muenchen*, *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, *Shigella sonnei*.

The effect of incubation temperatures on the efficacies of both plating media and transport or enrichment broths was determined by the analysis of 391 diarrheal stools for salmonellas and shigellae. Each analysis resulted in 90 observations. Stool specimens were homogenized in saline and used to inoculate eosin methylene blue (EMB), *Salmonella-Shigella* (SS), and xylose lysine deoxycholate (XLD) agar plates, Amies and Cary-Blair (CB) transport media, and gram-negative (GN) enrichment broth. All media were incubated at 25, 30, and 35°C for 24 and 48 h. In order of efficacy, GN and saline were significantly better than Amies and CB, which were still better than direct streaking for both salmonellas and shigellae. Forty-eight hours was a significant improvement over 24 h only at 25°C on direct streaking for both pathogens. In direct plating, XLD was better than both SS and EMB for both pathogens. After broths for salmonellas, XLD greater than SS greater than EMB, and for shigellae, XLD greater than EMB greater than SS, with all differences significant. SS agar was significantly improved for detection of shigellae with 48-h broth inocula versus 24-h broth inocula. The differences thus observed at the various temperatures tested proved to be less important than the media used. The efficient media, GN broth, saline-stool, and XLD were shown to be affected very little by either temperature or time variance of the magnitude tested (Holoman-Battelle)

W74-00646

POLYMER MEMBRANE ELECTRODES. PART I. A CHOLINE ESTER-SELECTIVE ELECTRODE,
Corning Glass Works, N. Y. Research and Development Lab.,
For primary bibliographic entry see Field 02K.
W74-00647

POLYMER MEMBRANE ELECTRODES. PART II. A POTASSIUM ION-SELECTIVE MEMBRANE ELECTRODE,
Corning Glass Works, N. Y. Research and Development Lab.
For primary bibliographic entry see Field 02K.
W74-00648

A STUDY OF LIQUID-MEMBRANE PERCHLORATE-SELECTIVE ELECTRODES MADE FROM AN ORGANIC RADICAL ION SALT,
Umeå Univ. (Sweden). Dept. of Analytical Chemistry.
M. Sharp.
Analytica Chimica Acta, Vol 65, No 2, p 405-416, July 1973. 4 fig, 2 tab, 12 ref.

Descriptors: *Aqueous solutions, Water analysis, Anions, Selectivity, Iodides, Nitrates, Sulfates, Bromides, Fluorides, Chlorides, *Electrodes. Identifiers: *Perchlorates, *Liquid membrane electrodes, *Perchlorate electrodes, *Ion selective electrodes, Detection limits, Response time, Chemical interference, Membrane electrodes, N-ethylbenzothiazole-2'-azaviole perchorate, Tetrafluoroborate, Hydroxyl ion, Chlorates, Selectivity coefficients, Acetates.

Liquid-membrane electrodes were prepared from solutions of N-ethyl-benzothiazole-2', 2'-azaviole perchorate in 1,2-dichlorobenene and in Beta-beta prime dichlorodimethyl ether, and their response and selectivity characteristics were examined. Perchlorate response ranges of the order 1-10 to the minus 6.5 power M and 1-10 to the minus 5.6 power M were shown to be attainable with the two systems, respectively. These values represent significant improvements over the range 1-10 to the minus 4.8 power M found for the solid state electrode made from the same radical ion salt. Short response times and acceptably stable potentials were observed for both liquid-membrane sensors. Both showed high apparent selectivities for perchlorate over all the ten anions tested (I, BF4, OH, NO3, C13, SO4, Br, F, CH, CO2, Cl). Iodide and tetrafluoroborate were the most serious interferences in each case. The low interference shown by hydrogen and hydroxide ions indicated that perchlorate determinations may be performed within the pH range 1-12 with both electrodes. (Little-Battelle)

W74-00649

ANION SELECTIVITY STUDIES ON LIQUID MEMBRANE ELECTRODES,
Florida Atlantic Univ., Boca Raton. Dept. of Chemistry.
R. E. Reinsfelder, and F. A. Schultz.
Analytica Chimica Acta, Vol 65, No 2, p 425-435, July 1973. 2 fig, 6 tab, 34 ref.

Descriptors: *Anions, *Selectivity, Permselective membranes, Ion exchange, Chlorides, Bromides, Iodides, Nitrates, Equilibrium, *Electrodes. Identifiers: *Liquid membrane electrodes, *Ion selective electrodes, Tris (1,10-phenanthroline)iron, Tris (4,7-diphenyl-1,10-phenanthroline)iron, Potentiometry, Selectivity coefficients, Organic solvents, Nitrobenzene, Chloroform, N-Amyl alcohol, Thiocyanates, Perchlorates, Fluoroborates, Fluorophosphates, Tetraheptylammonium ion, Calcium electrodes, Tetraheptylammonium nitrate, Tetraheptylammonium ion electrodes, Nitrate electrodes, Perchlorate electrodes, Tetrafluoroborate.

Selectivity coefficients of liquid-membrane electrodes for common inorganic anions were measured in electrodes containing tris (1,10-phenanthroline)iron (II), tris (4,7-diphenyl-1,10-phenanthroline)iron (II) or tetraheptylammonium ion in nitrobenzene, and tris (4,7-diphenyl-1,10-phenanthroline)iron (II) ion in nitrobenzene, chloroform or n-amyl alcohol as the liquid membrane. With the exception of the amyl alcohol elec-

trode, selectivity coefficients were relatively independent of membrane composition and followed a common sequence of decreasing selectivity: PF6 (minus) greater than C104 (minus) greater than SCN (minus) equivalent to I (minus) equivalent to Br (minus) greater than NO3 (minus) greater than Cl (minus) greater than F (minus). This sequence parallels the order of increasing anion hydration energy, suggesting that aqueous phase solvation energies play a predominant role in determining electrode selectivity for these ions. Time-dependent behavior of liquid-membrane electrodes on transfer between solutions containing different ions also is described. Instantaneous e.m.f. readings were used to determine selectivity coefficients. (Holoman-Battelle)

W74-00650

ELECTRON MICROSCOPE AND PHYSICAL CHEMICAL CHARACTERIZATION OF C-PHYCOCYANIN FROM FRESH EXTRACTS OF TWO BLUE-GREEN ALGAE,
New York State Dept. of Health, Albany. Div. of Labs. and Research.

M. Kessel, R. MacColl, D. S. Berns, and M. R. Edwards.

Canadian Journal of Microbiology, Vol 19, No 7, p 831-836, July 1973. 3 fig, 1 tab, 30 ref.

Descriptors: *Electron microscopy, *Aquatic algae, Cytological studies, *Cyanophyta, Plant pigments, Fluorescence.

Identifiers: C-phycocyanin, *Plectonema boryanum, *Calothrix parietina, Physical chemistry, *Photosynthetic pigments, Phycobilisomes, Sample preparation, Ultracentrifugation, Phoromium lundum, Sedimentation velocity centrifugation.

The particulate material (intact and dissociated phycobilisomes), adjacent to the thylakoids of Plectonema boryanum and Calothrix parietina, was examined in thin sections and in freshly prepared C-phycocyanin extracts. For the latter a method was developed using sphaeroplasts of log-phase cells. When examined by sedimentation velocity centrifugation, the sedimentation coefficients of the rapidly extracted C-phycocyanin were found to be 18 S and 5 S. Also, a 10-S boundary was observed with P. boryanum. When C. parietina was grown under red light the 18-S aggregates increased to 20 S. The 18 S particles, in electron micrography of negatively stained preparations, displayed eight subunits surrounding a central one. The possibility that some subunits fall out of the plane of view is contemplated in proposing a dodecamer arrangement for such particles. The 20-S particles were also examined by electron microscopy. However, the precise number of monomer units associated with either the 18-S or 20-S particles has not yet been ascertained. Thin sections of intact algal cells are presented to demonstrate the presence of phycobilisomes along the outer faces of the thylakoid membranes. (Holoman-Battelle)

W74-00652

MICROBIOLOGICAL EVALUATION OF COLD-WATER SHRIMP (PANDALUS BOREALIS),
Food and Drug Administration, Boston, Mass.

F. A. Zapata, and B. Bartolomeo.
Applied Microbiology, Vol 25, No 6, p 858-861, June 1973. 2 tab, 11 ref.

Descriptors: *Shrimp, *Food processing industry, *E. coli, Foods, Coliforms, Path of pollutants, Water pollution sources.

Identifiers: *MPN, *Staphylococcus, Pandanus borealis, Biological samples, Macroinvertebrates.

Samples of shrimp (Pandalus borealis) were collected from fishing boats before unloading and in various stages of processing for determination of most probable numbers of E. coli, coliforms, and

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coagulase-positive staphylococci and aerobic plate counts. Methods of the AOAC were used. Freshly harvested shrimp collected from fishing vessels had an APC geometric mean of 510/g; *E. coli*, coliforms, and coagulase-positive staphylococci were absent. Subsequent storage and insanitary practices during processing increased the APC and introduced coliforms. However, the low air temperatures (18 to 45°F) in the plants and the large volumes of cold water (34°F) used during processing inhibited significant bacterial buildup in the finished product. (Little-Battelle)

W74-00653

CLINICAL LABORATORY EXPERIENCE WITH THE IMPROVED ENTEROTUBE,
Long Island Jewish-Hillside Medical Center, New Hyde Park, N.Y.
B. G. Painter, and H. D. Isenberg.
Applied Microbiology, Vol 25, No 6, p 896-899, June 1973. 1 tab, 6 ref.

Descriptors: *Separation techniques, *Enteric bacteria, *Cultures, Methodology, Pollutant identification, Pathogenic bacteria, Coliforms, *E. coli*, *Salmonella*, *Shigella*.

Identifiers: *Enterotube, Method validation, Culture media, Arizona, *Citrobacter freundii*, *Citrobacter diversus*, *Klebsiella pneumoniae*, *Enterobacter aerogenes*, *Enterobacter cloacae*, *Enterobacter baumannii*, *Enterobacter liquefaciens*, *Serratia marcescens*, *Proteus vulgaris*, *Proteus mirabilis*, *Proteus morganii*, *Proteus rettgeri*, *Providencia*.

The improved Enterotube was tested with 586 representatives of the family Enterobacteriaceae to study its reliability in differentiating these bacteria. Several different media were also used in comparison tests to identify the microorganisms. The results show that the improved Enterotube has the ability to sequester significant reactions which lead to the identification of the various constituents of the family Enterobacteriaceae. Confirmation of the differentiation, especially of *salmonellae*, *shigellae*, *arizoneae*, and enteropathogenic *Escherichiae*, by serological techniques is also suggested. The reactions elicited with the improved Enterotube compare favorably with those obtained with media prepared in the laboratory. The limitations of preparation and standardization, neglected or ignored in laboratories without adequate facilities, personnel, and experience, can be overcome with this type of device. In this study, the improved Enterotube reacted more closely to the findings reported in the percentage tables of Ewing than did the conventional method for the first approximation of the identity of members of the family. (Little-Battelle)

W74-00655

POTENTIAL PATHOGENS IN THE ENVIRONMENT: KLEBSIELLA PNEUMONIAE, A TAXONOMIC AND ECOLOGICAL ENIGMA,
Oregon State Univ., Corvallis. Dept. of Microbiology.
C. Brown, and R. J. Seidler.
Applied Microbiology, Vol 25, No 6, p 900-904, June 1973. 3 tab, 31 ref.

Descriptors: *Isolation, *Pathogenic bacteria, *Pollutant identification, Systematics, Vegetable crops, Seeds, Nitrogen fixing bacteria, Methodology, Aquatic environment, Soil environment, White fir trees, Enteric bacteria, Carrots, Lettuce, Onions, Potatoes.

Identifiers: **Klebsiella pneumoniae*, *Serotypes, *Selective media, Biochemical characteristics, Environmental samples, Biochemical tests, Culturing techniques, Mushrooms.

A nitrogen-deficient medium and m-Endo agar were employed in the isolation of members of the tribe Klebsieae from surfaces of vegetables and seeds. With m-Endo agar at an incubation tem-

perature of 37°C, nearly 50 percent of the vegetables and seven out of seven seed samples yielded organisms which biochemically and serologically were identified as *Klebsiella pneumoniae*. Viable counts were generally in the range of 1000 cells per g of vegetable peel or seed. Organisms classified as *K. pneumoniae* exhibited seven different IMViC patterns, with the minus minus plus plus, plus plus plus plus, and minus plus plus plus patterns most common. Seven of the eleven *K. pneumoniae* serotypes encountered have previously been isolated from human urinary tract and other infections. Fifty percent of the 40 *K. pneumoniae* examined exhibited positive acetylene-reducing activity, i.e., they possessed the capability for fixing N₂. Vegetables containing *K. pneumoniae* may constitute a potential reservoir for human nosocomial genitourinary or other infections. (Holoman-Battelle)

W74-00656

GENTAMICIN BLOOD AGAR USED AS A GENERAL-PURPOSE SELECTIVE MEDIUM,
Saint Joseph's Hospital, London (Ontario). Dept. of Microbiology.

W. A. Black, and F. Van Buskirk.
Applied Microbiology, Vol 25, No 6, p 905-907, June 1973. 1 tab, 6 ref.

Descriptors: *Isolation, *Pathogenic bacteria, Enteric bacteria, Coliforms, Aerobic conditions, Anaerobic conditions, Incubation, Yeasts, Cultures, Anaerobic bacteria, *E. coli*, Aerobic bacteria, *Pseudomonas*, Fungi, Methodology.

Identifiers: *Culture media, *Selective media, *Gentamicin blood agar, Survival, Gram-negative bacteria, Streptococci, Enterococci, Streptococcus viridans, Bacteroides, *Clostridium perfringens*, *Serratia marcescens*, *Proteus*, *Staphylococci*, *Klebsiella*, *Enterobacter*, *Acinetobacter*, *Flavobacterium*, *Providencia*.

The potential value of a blood agar medium containing a final concentration of 5.5 micrograms of gentamicin per ml was assessed in a diagnostic laboratory over an 8-week period. Nine hundred sixty-six consecutive clinical specimens submitted to laboratory section were plated on routine culture media and then on one-quarter of a gentamicin blood agar (GBA) plate. In all cases the routine culture media contained 7.5 percent sheep blood agar plates for aerobic and anaerobic incubation and a MacConkey plate. The routine plates were read after 48 h incubation and the GBA plates after overnight incubation. Two hundred twenty-four of the specimens failed to grow on either routine culture media or GBA. The medium gave increased isolation rates of beta-hemolytic streptococci, other streptococci, Bacteroides, clostridia, and yeasts. Gentamicin-resistant gram-negative bacteria isolated only on GBA included 20 (26 percent) strains of Bacteroides and 10 (77 percent) strains of *Providencia*. Gentamicin resistant gram-negative bacteria isolated on both GBA and routine culture media included three strains of *Klebsiella-Enterobacter*, and six strains of *Serratia marcescens*. GBA inhibited the growth of most strains of staphylococci and *Klebsiella-Enterobacter*, and all strains of *Escherichia coli* and *Pseudomonas*. (Holoman-Battelle)

W74-00657

IDENTIFICATION OF THE PROTOTHECA SPECIES BY IMMUNOFLUORESCENCE,
North Carolina Univ., Chapel Hill. School of Public Health.

M. S. Sudman, and W. Kaplan.
Applied Microbiology, Vol 25, No 6, p 981-990, June 1973. 2 fig, 6 tab, 22 ref.

Descriptors: *Pathogenic fungi, *Pollutant identification, Speciation, Chlorella, Methodology.

Identifiers: *Fluorescent antibody techniques, *Immunofluorescence, *Protothece, Chromogenic

reagents, Fluorescein isothiocyanate, Sample preparation, *Protothece filamentosa*, *Protothece moriformis*, *Protothece stagnora*, *Protothece wickerhamii*, *Protothece zoppii*, *Protothece pastoriensis*, *Protothece chlorelloides*, *Protothece trispila*, *Protothece urbzityi*, *Coccidioides immitis*, *Blastomyces dermatitidis*, *Cryptococcus neoformans*, *Paracoccidioides brasiliensis*.

Studies were carried out to develop fluorescent antibody reagents for the identification of the *Protothece* species and for their differentiation from morphologically similar fungi of various genera in formalin-fixed tissues. Antisera against representative isolates of *P. filamentosa*, *P. moriformis*, *P. stagnora*, *P. wickerhamii*, and *P. zoppii* were produced in rabbits. Antiglobulins, labeled with fluorescein-isothiocyanate that intensely stained most cells of the homologous species, were selected for use as potential diagnostic reagents. By adsorbing the conjugates with selected heterologous cross-straining *protothecae*, reagents that were both sensitive and specific were obtained. Evaluation of the adsorbed conjugates with sections of tissue infected with *protothecae*, sections of tissue infected with morphologically similar fungi, and cultures of *protothecae* showed that these reagents are useful for the rapid and reliable identification of the *Protothece* species. (Holoman)

W74-00659

THE DETECTION OF CLOSTRIDIUM WELCHII IN THE DIFFERENTIAL REINFORCED CLOSTRIDIAL MEDIUM TECHNIQUE,

Ministry of Agriculture, Belfast (Northern Ireland).

P. A. Gibbs.
Journal of Applied Bacteriology, Vol 36, No 1, p 23-33, March 1973. 5 tab, 16 ref.

Descriptors: *Isolation, *Pollutant identification, Methodology, *Poultry, Anaerobic bacteria, Cultures.

Identifiers: *Differential reinforced clostridial medium, **Clostridium welchii*, Poultry processing plants, Culture media, Clostridium bifermentans, Swab sampling, Counts, Animal tissues.

Studies were made to investigate the sensitivity of the DRCM (Differential Reinforced Clostridial Medium) techniques for isolating *Clostridium welchii* and to determine whether the method could be made more sensitive without increasing unduly the length of time necessary to obtain a result. Swab samples were taken of working surfaces and equipment and carcass samples from poultry processing plants. Water samples from one plant were taken from spinchillers and from a giblet washer. All DRCM cultures confirmed positive were streaked on lactose-egg yolk-milk (LEYM) medium for identification. Cultures of known strains of *C. welchii* and *C. bifermentans* were grown separately at 37 degrees in cooked meat broth. Microscopic counts and a total viable count using the pour plate technique with a tryptone-yeast extract (TYE) agar were made. Mixtures of the two bacteria were cultured using DRCM, incubated at 37 degrees for 48 h and scored positive or negative. All positives in the 'presumptive total' DRCM count, in the completed 'total' count, and in the spore count were streaked on LEYM for identification. Although the DRCM method can detect low numbers of clostridia, the detection of *C. welchii* requires that all positive DRCM cultures in the 'presumptive total' count be examined before heat treatment for the presence of this species, and the LEYM agar medium affords a simple method for doing this. Data obtained on sampling 3 sites on each of 30 carcasses from the 3 processing plants showed that the vent and neck sites of carcasses from each plant had a markedly higher rate of contamination with clostridia than the breast, both in the 'total' count and in the spore count. (Holoman-Battelle)

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W74-00661

A COMPARISON OF THE DISTRIBUTION OF INTESTINAL BACTERIA IN BRITISH AND EAST AFRICAN WATER SOURCES,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W74-00662

A MEDIUM FOR COUNTING AQUATIC HETEROTROPHIC BACTERIA IN POLLUTED AND UNPOLLUTED WATERS,
University of Wales Inst. of Science and Tech., Cardiff.
For primary bibliographic entry see Field 05B.
W74-00663

RESPONSES OF A MIXED PHYTOPLANKTON POPULATION TO NUTRIENT ENRICHMENTS OF AMMONIA AND PHOSPHATE, AND SOME ASSOCIATED ECOLOGICAL IMPLICATIONS,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W74-00665

DIRECT MEASUREMENT OF POTASSIUM PERMANGANATE DEMAND AND RESIDUAL POTASSIUM PERMANGANATE,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
R. Engstrom-Heg.
N Y Fish Game J. Vol 18, No 2, p 117-122. 1971.

Identifiers: *Direct measurement, *Potassium permanganate, Residuals, Analytical techniques, Pollutant identification.

In natural waters treated with KMnO₄ nanate, residual KMnO₄ and KMnO₄ demand may be measured colorimetrically after appropriate dilution and treatment with orthotolidine. Procedures and formulas are given for determinations made with a spectrophotometer-colorimeter and for field determinations made with a color comparator.—Copyright 1973, Biological Abstracts, Inc.
W74-00765

ORGANOCHLORINE RESIDUES IN HARP SEALS (*PAGOPHILUS GROENLANDICUS*) CAUGHT IN EASTERN CANADIAN WATERS,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
For primary bibliographic entry see Field 05C.
W74-00766

SAMPLING AND ANALYSIS OF CHEMICAL POLLUTANTS IN RIVER WATER,
Lee Conservancy Catchment Board (England).
D. C. Hinge.
Chemistry and Industry, No 15, p 727-732, August 4, 1973. 3 fig, 1 tab, 14 ref.

Descriptors: *Water analysis, *Pollutant identification, *Analytical techniques, *Monitoring, Rivers, Europe, *Water quality control, Water law, Legislation, Regulation, Computers, Automation, Instrumentation, Legal aspects, Hydrologic data, Testing procedures, Governments, Administration, Data processing.
Identifiers: Regional governments, *United Kingdom, Great Britain, Lee River.

In the United Kingdom, impetus for regional river authorities to provide facilities for monitoring stream quality came largely from the Rivers (Prevention of Pollution) Acts passed in 1951 and 1961, and the Water Resources Act of 1963. The work performed by the Lee Conservancy Catchment Board on the Lee River and its tributaries in a 500 square mile area with a population of about two million studies being conducted. Par-

ticular attention is being paid to nitrates and pesticides. Manual and instrumental techniques used are indicated, including gravimetry, colorimetry, titrimetry, electrochemical analysis, chromatography, atomic absorption spectroscopy/flame photometry, and other methods for routine determinations of suspended solids, sulfate, nitrogen and phosphorus compounds, detergents, herbicides, dissolved oxygen, and various metal trace elements. Future trends, started with the AutoAnalyzer, will include data collection and interpretation aided by computers. (Brown-IPC)
W74-00773

ANALYSIS OF WASTE WATERS AND INTERPRETATION OF THE RESULTS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
A. C. Docherty.
Proceedings of the Society for Analytical Chemistry, Vol 10, No 8, p 201-202, August 1973.

Descriptors: *Water analysis, *Analytical techniques, *Pollutant identification, *Monitoring, Toxicity, *Biochemical oxygen demand, Water pollution, *Industrial wastes, *Municipal wastes, Stream improvement, Rivers, Estuaries, Foreign countries, Waste water treatment, Instrumentation, Pollutants, Effluents, Fish, Ammonia, Zinc, Iron compounds, Chlorine, Chlorine compounds, Phenol, Ammonium compounds, Waste dilution, Persistence.

Identifiers: Total organic carbon (TOC), Continuous processes, Tees River (England), United Kingdom, British Water Research Association, Instrumental analysis, Cyanides, Chlorophenols, Hypochlorites, Synergism.

Pollution of the Tees Estuary is being reduced by a joint industry/local authority program that promises to halve the effluent pollution loads by 1975 and to lure fish back into the Tees River. Problems of waste water sampling, analysis, and data interpretation are illustrated. Simultaneous presence of several pollutants may cause either additive or cancelling effects. Thus, ionized ammonium salts in acid solution are nontoxic to fish, but can produce unionized ammonia, which is highly toxic, when the water pH approaches alkalinity. Similarly, the interaction of phenol with hypochlorite, both toxic, forms chlorinated phenol that is not only more toxic but also more odorous and more persistent than either reactant alone. By contrast, highly toxic cyanide, when complexed by iron, may form the much less toxic hexacyanoferrate ion. Limited monetary resources may, in addition, force a choice between alternative treatments, e.g., whether to eliminate cyanide (which is readily degraded biologically when diluted) or the less toxic zinc (which is, however, quite persistent in the environment, regardless of dilution). An instrumental method for the continuous monitoring of TOC (total organic carbon), developed by ICI Ltd. and the British Water Research Association, is recommended in lieu of the tedious five-day BOD test which is unsuited for the speedy characterization of industrial effluents. (Brown-IPC)
W74-00778

THE IDENTIFICATION OF SOURCES OF OIL SPILLS,
Laboratory of the Government Chemist, London (England).
D. M. Green, and J. Roburn.
Proceedings of the Society for Analytical Chemistry, Vol 10, No 8, p 202-203, August 1973.

Descriptors: *Oil spills, *Analytical techniques, *Pollutant identification, *Water pollution sources, Oil, Oil pollution, Fuels, Chromatography, Gas chromatography, Chemical analysis, Flame photometry, Mass spectrometry, Separation techniques, X-ray fluorescence, Spectroscopy, Sulfur compounds, Nickel, Evaporation, Weathering, Sampling, Organic compounds.

Identifiers: Molecular sieve chromatography (or Gel filtration), Fractionation, Vanadium, Isoprenes, Phytane, Pristane, Thiophenes, Naphthalenes, Atomic absorption spectroscopy, Hydrocarbons, Alkanes (or Aliphatic hydrocarbons).

Analytical techniques for tracing the sources of oil spills can greatly aid in the enforcement of water pollution laws. Temperature-programmed gas-liquid chromatography (GLC) with a packed column, nonpolar stationary phase, and flame-ionization detector gives hydrocarbon profiles which indicate the type of oil (crude, fuel, or tanker sludge). More specific characterizations can be obtained by separation of isoprenoid alkanes, phytane, pristane, and its 18-carbon homolog, using fractionation on Sephadex LH-20 columns plus gel filtration on silica gel and 5A molecular sieve. A few crude oils that are difficult to resolve by isoprenoid ratios, particularly after weathering, have been characterized by their vanadium and nickel contents, determined directly by x-ray fluorescence and atomic-absorption spectroscopy. Among other supporting evidence, distinct GLC profiles for many crude oils in combination with mass spectroscopy showed the presence of dibenzothiophenes having 11-15 carbon atoms and sufficiently high boiling points to limit evaporative losses, while C11-C13 naphthalenes were less useful for confirmatory analysis. Capillary gas chromatography can resolve mixtures of isoprenoids without prior separation, but given inferior reproducibility and is impractical for samples as small as 2-3 mg. For source identification of fuel oils, which vary much more in chemical composition, the availability of a suspect sample is essential. (Brown-IPC)
W74-00780

PROPOSAL OF A SIMPLIFIED MANOMETRIC METHOD FOR MEASURING BIOCHEMICAL OXYGEN DEMAND — RESULTS AND PROBLEMS (VORSCHLAG EINER VEREINFACHTEN MANOMETRISCHEN METHODE ZUR MESSUNG DES BIOCHEMISCHEN SAUERSTOFFBEDARFS — ERGEBNISSE UND PROBLEME),
Institut fuer Zellstoff und Papier, Heidenau (East Germany).

H. Schmidt, and G. Weigt.
Zellstoff und Papier, Vol 21, No 5, p 131-140, May 1972. 8 fig, 6 tab, 17 ref.

Descriptors: *Biochemical oxygen demand, *Testing procedures, *Analytical techniques, *Water analysis, Laboratory tests, Instrumentation, Laboratory equipment, Kinetics, Foreign research, Waste water (Pollution), Water pollution, Organic loading.

A modified Warburg apparatus, called 'Biometer', is used in BOD determinations requiring only 2-4 days for complete decomposition of organic matter, compared to 5-7 days using the standard dilution method. The apparatus is rugged, inexpensive, and easy to operate with satisfactory (2-4%) accuracy, provided constant test conditions are maintained, including effluent composition. Optimum operating conditions were established after studies of variables involved. Kinetic studies indicated the conditions under which a reaction of the first order can be expected. Examples of BOD calculations based on short-term rate constant measurements are given. (Speckhard-IPC)
W74-00782

CHEMICAL ANALYSIS OF WATER EFFLUENTS — LESSONS FROM THE U.S. (ARMY CORPS OF ENGINEERS) PERMIT PROGRAM,
Institute of Paper Chemistry, Appleton, Wis. Div. of Natural Materials and Systems.

D. B. Easty.
Paper Trade Journal, Vol 156, No 49, p 26-29, Nov. 27, 1972. 5 tab, 19 ref.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

Descriptors: Water analysis, *Water permits, Analytical techniques, *Sampling, *Pollutant identification, *Pulp wastes, *Water pollution, *Permits, Discharge (Water), *Legislation, Regulation, Chemical analysis, Pulp and paper industry, Ammonia, Phosphates, Sulfur compounds, Sulfides, Sulfite liquors, Phenols, Organic compounds, Inorganic compounds, Nitrates, Odor, Taste, Color, Effluents, Industrial wastes. Identifiers: River and Harbor Act.

Stricter enforcement of the 1899 River and Harbor Act required applications for discharge permits to be filed with the U.S. Corps of Engineers by July 1, 1971, listing analytical details on industrial outfalls. Paper mills unprepared to meet the deadline requested help from the Institute of Paper Chemistry (Appleton, Wis.), where a team of experts wrestled with the sampling and analytical problems imposed by the instability and mutual interference of some stream components. Using grab samples in addition to continuous samplers, specific preservatives (which are listed), and modified quantitative methods, the needed data were successfully supplied. Thus, interferences in the Nessler ammonia test were avoided by adopting the phenate method. A special charcoal ('Nuchar C-190N') decolorized samples with minimum loss of nitrate. Interferences in the phenol red method of bromide analysis were removed by acid digestion followed by alkaline ignition of samples. Sulfides which caused atypical colors in phosphate determinations were removed with bromine water. Omission of the neutralizing step in the single-reagent method avoided formation of difficult to filtered precipitate in total phosphorus analyses. Mutual interference between sulfite and sulfide was minimized by selective absorption of sulfur dioxide before determining sulfides, and by precipitating sulfide prior to sulfite determinations. Although pulp mill effluents showed high phenol contents, not all phenolic compounds may contribute to objectionable odor and taste of receiving waters. (Brown-IPC)

W74-00791

WATER REUSE IN INDUSTRY, PART 3 -- MINE WATER,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W74-00796

ADSORPTIVE EXTRACTION FOR ANALYSIS OF COPPER IN SEAWATER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W74-00827

DISTRIBUTION OF TRACE METALS IN THE PORE WATERS OF SHALLOW WATER MARINE SEDIMENTS,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.
For primary bibliographic entry see Field 02K.
W74-00828

SEASONAL VARIATIONS OF CADMIUM, COPPER, MANGANESE, LEAD, AND ZINC IN WATER AND PHYTOPLANKTON IN MONTEREY BAY, CALIFORNIA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 02K.
W74-00829

CHANGES IN THE CONCENTRATION OF SOLUBLE AND PARTICULATE IRON IN SEA-WATER ENCLOSED IN CONTAINERS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.

W74-00830

CURRENT PRACTICE IN GC-MS ANALYSIS OF ORGANICS IN WATER,
Environmental Protection Agency, Athens, Ga.
Southeast Environmental Research Lab.

G. R. Webb, A. W. Garrison, L. H. Keith, and J. M. McGuire.

Copy available from GPO Sup Doc as EPI.23/2:73-277, \$1.25; microfiche from NTIS as PB-224 947/2, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-277, August 1973. 91 p, 16 fig, 6 tab, 26 ref. EPA Project 16020 GHP.

Descriptors: *Pollutant identification, *Water sampling, *Solvent extractions, *Gas chromatography, *Mass spectrometry, Industrial wastes, Organic wastes, Data storage and retrieval, Water pollution sources, Water chemistry.

Identifiers: Waste identification, Derivative formation, Clean-up, Case histories, Kuderna-Danish Evaporator.

Experiences during five years of evaluating the application of gas chromatography-mass spectrometry (GC-MS) to wastewater analysis at the Southeast Environmental Research Laboratory have resulted in the selection of recommended practices for such applications. Liquid-liquid extraction with solvents such as methylene chloride and chloroform removed greater than 50 percent of compounds found in pulp mill and petrochemical waste at concentrations of 2 microgram/l to 20 microgram/l. The Kuderna-Danish evaporator was the most effective means of concentration after extraction. Diazomethane and dimethyl sulfate proved to be the most effective of five methylation reagents studied. Packed columns were effective for gas chromatography of simple mixtures and SCOT columns provided better overall performance for complex mixtures. Computerized data reduction was essential for practical use of GC-MS for samples containing many compounds. A computerized spectra matching program proved highly effective in identifying compounds contained in the computer library. The system was shown to be effective in solving problems related to fishkills caused by pesticides, confirmation of polychlorinated biphenyl residues in water and identification of compounds discharged by over a dozen industries. Over two hundred compounds were identified in industrial effluents. (EPA)

W74-00834

HYDROCHEMICAL ZONALITY OF URAL LAKES (GIDROKHIMICHESKAYA ZONAL'NOST' OZER URALA),
For primary bibliographic entry see Field 02H.
W74-00840

INTERACTION OF NITRILOTRIACETIC ACID WITH SUSPENDED AND BOTTOM MATERIAL.

National Bureau of Standards, Washington, D.C.
Analytical Chemistry Div.

Copy available from GPO Sup Doc as EP-1.16:16020 GFR 07/71, \$0.45; microfiche from NTIS as PB-225 023/1, \$1.45. Environmental Protection Agency, Water Pollution Control Research Series, July 1971. 31 p, 12 tab, 8 ref.

Descriptors: *Detergents, *Absorption, Analytical Techniques, Neutron Activation Analysis, *Nitrilotriacetic acid, *Pollutant identification, Trace elements, *Bottom sediments, Suspended solids, Sediments, Metals.

An experimental investigation was made of the possible interaction of residual concentrations of nitrilotriacetic acid in surface waters with metallic elements contained in sediments and bottom materials. Samples of bottom materials from typical bodies of surface waters were analyzed for

their major, minor, and trace constituents. Eight representative samples of these were equilibrated with distilled water and with water containing 20 ppm of NTA and the resulting solutions were analyzed by three analytical techniques. Elements showing essentially no increased solubility in the presence of NTA were: barium, antimony, molybdenum, strontium, chromium, silver, tin, iron, lead, cadmium, copper, and mercury. Elements showing small increases in solubility were: nickel, zinc, manganese, and cobalt. Calcium and magnesium concentrations. (EPA)

W74-00926

SOME SIMPLE METHODS FOR LIMNOLOGICAL STUDY IN SHALLOW WATER,
Institut Royal des Sciences Naturelles de Belgique, Brussels.

For primary bibliographic entry see Field 07B.

W74-00998

COMPARISON OF 2 METHODS OF TREATING WATER SAMPLES ('ACTUAL IN SITU' AND 'SIMULATED IN SITU') FOR STUDY OF PRIMARY PRODUCTION BY THE CARBON 14 TECHNIQUE (IN FRENCH),
For primary bibliographic entry see Field 07B.
W74-01004

CONCERNING A NEW GRAPHIC METHOD FOR STUDY OF NATURAL WATERS (IN FRENCH),
Institut National des Sciences Appliquées, Toulouse (France).
For primary bibliographic entry see Field 02K.
W74-01008

TIME-TABLES AS A METHOD TO RECORD CHANGES IN PLANKTON COMPOSITION,
Research and Advisory Inst. for Field Crop and Grassland Husbandry, Wageningen (Netherlands).
For primary bibliographic entry see Field 07B.
W74-01010

STREAM AND LAKEFRONT FIELD INVENTORY, VOLUME I - SUMMARY.
Lorain County Regional Planning Commission, Elyria, Ohio.
For primary bibliographic entry see Field 05B.
W74-01046

THE VECTOR OF SAPROBITY AND THE SYSTEM OF WATER QUALITY,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology. V. Sladecek.

Pol Arch Hydrobiol. Vol 19, No 2, p 211-213, 1972. Illus.

Identifiers: *Saprobitv vector, *Water quality, *Indicators.

A modification of Golowin's (1968) vector of saprobity was proposed for the general scheme of water quality. All 5 limnosaprobic as well as 4 eusaprobic degrees were included in the half circle. The vector of saprobity played the role of indicator.--Copyright 1973, Biological Abstracts, Inc.

W74-01074

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1971 WATER YEAR,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W74-01086

WATER QUALITY ASSESSMENT PRACTICE IN AUSTRALIA,
Melbourne Water Science Inst. (Australia).

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

For primary bibliographic entry see Field 02K.
W74-01089

THE DEVELOPMENT AND PRELIMINARY APPLICATION OF AN INVARIANT COUPLED DIFFUSION AND CHEMISTRY MODEL, Aeronautics Research Associates of Princeton, Inc., N.J.

G. R. Hilst, C. D. Donaldson, M. Teske, R. Contiliano, and J. Freiberg.
Available from NTIS, Springfield, Va. 22151 NASA CR-2295 Price \$3.75 (\$6.25 foreign) printed copy; \$1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2295, September 1973. 82 p, 25 fig, 2 tab, 2 append. NASA Contract NAS1-11433.

Descriptors: *Atmosphere, *Aircraft, *Fallout, Chemical reactions, Model studies, Turbulent flow, Winds, Ozone, Diffusion, Kinetics, *Air pollution.

Identifiers: *Aircraft exhaust, Stratospheric wake.

The development of invariant models (second-order closure) of diffusion and chemical reactions in turbulent air flow system is described. One of the objectives has been to provide guidance for the design of a possible NASA program for in situ measurements of SST exhaust products at cruise altitudes (about 20 km) and, eventually, to use the models for data analysis and interpretation. An approximate closure scheme for a chemical kinetic submodel which conforms to the principles of invariant modeling and which accounts for the effects of inhomogeneous mixing over a wide range of conditions has been developed. This submodel has been coupled successfully with invariant turbulence and diffusion of two reacting (isothermally) chemical species. The initial calculations indicate the ozone reactions in the wake of stratospheric aircraft will be substantially affected by the rate of diffusion of ozone into the wake, and in the early wake, by unmixingness. (Woodard-USGS)

W74-01095

5B. Sources of Pollution

A EUTROPHICATION MODEL OF THE WHITE RIVER BASIN ABOVE BEAVER RESERVOIR IN NORTHWEST ARKANSAS, Arkansas Univ., Fayetteville. Dept. of Civil Engineering.

For primary bibliographic entry see Field 05C.

W74-00555

TRAVEL TIME OF GEORGIA STREAMS, Georgia Inst. of Tech., Atlanta. School of Civil Engineering.

For primary bibliographic entry see Field 04A.

W74-00556

GROUND WATER, A RESOURCE TO BE PROTECTED, Minnesota Dept. of Natural Resources, St. Paul.

R. L. Herbst.

In: Proceedings of Conference on Toward a Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 8-10, February 1973. 14-31-0001-3823.

Descriptors: *Water resources development, *Water pollution control, *Groundwater, *Minnesota, Conferences, Water management (Applied), Data collections, Hydrologic data, Hydrogeology, Information exchange.

In the next few years, critical water resource decisions must be made in Minnesota. The availability

and occurrence of water and the present and future water needs must be determined in sufficient detail to provide guidance to policy objectives. Policies must be implemented through a coordinated effort of all levels of government. The legal framework necessary for the management of water resources must be built. Responsibilities for the management, development, and coordination of State water programs must be specified within a simplified framework. (See also W73-09113) (Knapp-USGS)
W74-00566

THE NATIONAL QUALITY OF GROUND WATER IN MINNESOTA, Geological Survey, St. Paul, Minn.

For primary bibliographic entry see Field 02F.
W74-00567

THE USE OF GROUNDWATER IN MINNESOTA, Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters, Soils and Minerals.

For primary bibliographic entry see Field 04B.
W74-00568

HYDROGEOLOGIC FRAMEWORK FOR DETERIORATION IN GROUNDWATER QUALITY, Minnesota Univ., St. Paul. Dept. of Geology and Geophysics.

H. O. Pfannkuch, and P. K. Saint.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 35-58, February 1973. 6 fig, 8 ref. 14-31-0001-3823.

Descriptors: *Path of pollutants, *Groundwater movement, *Water chemistry, Minnesota, Monitoring, Underground waste disposal, Waste disposal wells, Water pollution sources, Water pollution effects.

The chemical quality of groundwater will reflect the geochemical material it has been in contact with, the path it has followed underground, the residence time spent in the subsurface, and the initial quality of the water upon entering the aquifer system. In much the same way the system interacts with manmade contaminants. It is, however, subjected to chemical and hydrologic stresses that may go beyond the self-regulatory capacities of the system and cause irreversible damages. The two principal processes that bear on groundwater quality deterioration are hydraulic transport and dispersion which physically moves contaminants into and through the groundwater reservoir, and physicochemical reactions. A small source of highly concentrated contaminants can pollute very large quantities of groundwater. The effect of the reaction processes is in general that of decontamination and purification of waste water. The purifying capabilities have to be known in order to properly assess the role of the underground in determining water quality. The main processes occurring are mechanical filtration, sorption, ion exchange, oxidation, biochemical stabilization and microbial decomposition, chemical precipitation and coprecipitation as well as gas exchange. Proper planning and management are needed to prevent or minimize deterioration. Once an understanding of the workings of the system has been obtained and certain social, environmental and economic goals have been incorporated into a management plan, it becomes necessary to monitor the system to see whether objectives are met. (See also W73-09113) (Knapp-USGS)

W74-00569

GROUND WATER POLLUTION PROBLEMS IN MINNESOTA, Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality. D. Wikre.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 59-78, February 1973, 9 fig, 12 ref. 14-31-0001-3823.

Descriptors: *Water pollution sources, *Groundwater, *Minnesota, *Path of pollutants, Groundwater movement, Sewage disposal, Waste water disposal, Water pollution control.

One of Minnesota's most important and abundant natural resources is its high quality water, both surface and underground. In recent years there has been a great deal of concern over the deteriorating quality of lakes and rivers. Problems involving municipal and industrial discharges are continually in the news. Large sums of money are being spent to clean up and protect the State's surface waters. During the same period, concern for groundwater quality has been increasing but at a slower rate. This may be because there are a smaller number of groundwater pollution problems in Minnesota. However, the main reason for lack of concern is the fact that the pollution is not visible. After the contamination has entered the ground, it may go undetected for years, until it appears in wells some distance from the original point of contamination. Most groundwater pollution problems can be grouped into six classes. These are problems resulting from individual sewage disposal systems, from agricultural practices, from municipal waste disposal practices, industrial waste disposal practices, petroleum products spills and leaks, and from the use of disposal wells. (See also W73-09113) (Knapp-USGS)

W74-00570

ESTABLISHING THE IMPACT OF AGRICULTURAL PRACTICES ON GROUNDWATER QUALITY, Minnesota Univ., Minneapolis. Dept. of Soil.

R. G. Gast, and P. R. Goodrich.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 79-91, February 1973. 1 fig, 4 tab, 9 ref. 14-31-0001-3823.

Descriptors: *Water pollution sources, *Groundwater, *Farm wastes, *Fertilizers, Nitrogen, Water quality, Nitrates, Water pollution. Identifiers: Groundwater pollution.

Agricultural croplands constitute about 35% of the total land area of the State of Minnesota and consequently overlay extensive groundwater reserves. Agricultural practices on these lands often involve application of large quantities of herbicides, pesticides, and nitrogen, phosphorus and potassium in fertilizers and animal wastes which pose potential threats to groundwater quality. All of these materials except nitrogen are strongly absorbed by the soil and pose little threat to groundwaters. Nitrogen (as nitrate) is mobile and will move into groundwaters if allowed to accumulate in the soil. Optimum crop yields can be sustained without nitrate accumulations in the soil if proper fertilization rates are used. If animal wastes are concentrated in a small area, they may move almost directly into the groundwater by such mechanisms as sinkholes and defective well casings or by saturated flow through soils. Contamination of groundwaters from such sources can be minimized by locating larger operations con-

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Group 5B—Sources of Pollution

sistent with proper soil and hydrologic conditions. (See also W73-09113) (Knapp-USGS)
W74-00571

NEEDS AND USES FOR A GROUND WATER QUALITY DATA SYSTEM,
Minnesota Univ., St. Paul. Agricultural Extension Service.
For primary bibliographic entry see Field 07A.
W74-00573

WATER WELL RECORDS AND INFORMATION SYSTEM NEEDS,
Minnesota Dept. of Health, Minneapolis. Div. of Environmental Health.
For primary bibliographic entry see Field 07C.
W74-00574

SUBSURFACE GEOLOGIC INFORMATION SYSTEM IN MINNESOTA: A STATUS REPORT,
Geological Survey, Minneapolis, Minn.
For primary bibliographic entry see Field 07C.
W74-00575

GROUND WATER QUALITY INFORMATION SYSTEMS - EXPERIENCES IN OTHER STATES,
Minnesota Univ., Minneapolis. School of Public Health.
For primary bibliographic entry see Field 07C.
W74-00576

UTAH'S GROUND WATER QUALITY INFORMATION SYSTEM,
Utah State Div. of Health, Salt Lake City.
For primary bibliographic entry see Field 07C.
W74-00577

FEDERAL WATER INFORMATION SYSTEMS,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W74-00578

RELATION OF GROUND WATER QUALITY INFORMATION SYSTEM AND OTHER SYSTEMS IN MINNESOTA,
Minnesota State Planning Agency, St. Paul.
For primary bibliographic entry see Field 07C.
W74-00579

PROPAGATION OF SINUSOIDAL SOLUTE DENSITY OSCILLATIONS IN THE MOBILE AND STAGNANT PHASES OF A SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W74-00604

DISSOLVED ALUMINUM IN ACID SULFATE SOILS AND ACID MINE WATERS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil and Science and Geology.
N. Van Bremen.

Soil Science Society of America Proceedings, Vol 37, No 5, p 694-697, September-October 1973. 2 fig, 1 tab, 16 ref.

Descriptors: *Sulfates, *Acid mine water, *Soil chemistry, Aluminum, Hydrogen ion concentration, Water pollution effects, Water pollution sources, Acidic soils, Saline soils.

Analytical data on water samples from acid sulfate soils and acid mine spoils indicate that the upper limit of dissolved Al is regulated by a basic aluminum sulfate with the stoichiometric composition $\text{Al}(\text{OH})_3\text{SO}_4$. The observed solubility relationship, $\text{pAl} + \text{pOH} + \text{pSO}_4 \pm 17.23$, can be useful in

defining environmental conditions in terms of pH and dissolved sulfate for the occurrence of Al concentrations toxic to plants. (Knapp-USGS)
W74-00607

SALTS IN IRRIGATION DRAINAGE WATERS: I. EFFECTS OF IRRIGATION WATER COMPOSITION, LEACHING FRACTION, AND TIME YEAR ON THE SALT COMPOSITIONS OF IRRIGATION DRAINAGE WATERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 04C.
W74-00609

BIOAMMIFICATION OF P,P'-DDT AND METHOXYCHLOR BY BACTERIA,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
B. T. Johnson and J. O. Kennedy.
Applied Microbiology, Vol 26, No 1, p 66-71, July 1973. 3 fig, 3 tab, 19 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Aquatic bacteria, Radioactivity techniques, Soil bacteria, Pesticide residues, Biomass, Insecticides, *DDT, Aerobic bacteria, Anaerobic bacteria.
Identifiers: *Biological magnification, p,p'-DDT, *Methoxychlor, *Bacillus subtilis, *Aerobacter aerogenes, Bioaccumulation, Chemical recovery.

Strains of Aerobacter aerogenes and Bacillus subtilis were exposed to 1 ppm C-14-labeled DDT or methoxychlor in distilled water to determine uptake kinetics and retention of the pesticides. The bacteria accumulated p,p'-DDT and methoxychlor directly from water. Uptake of both C-14-labeled organochlorine insecticides was rapid; 80 to 90 percent of the 24-h residues were reached with 30 min. Total cellular residues varied linearly with concentrations of DDT and methoxychlor in water ranging from 0.5 to 5.0 micrograms/liter. The residue magnification factors from water were between 1,400- to 4,300-fold, but were independent of insecticide concentrations in water. When the insecticide-exposed microbial cells were washed with pesticide-free water, DDT residues were 45 percent in *A. aerogenes* and 30 percent in *B. subtilis*, whereas the methoxychlor level decreased nearly 75 percent in both organisms. Subsequent washing did not further reduce the insecticide residue. Autoclave-killed bacteria also rapidly adsorbed DDT and methoxychlor from water and, in some instances, residues were higher than in the living cells. Molecular polarity and lipid solubility appear to influence the retention of the organochlorine insecticides by bacterial cells. (Holoman-Battelle)
W74-00615

BACTERIAL ENDOTOXINS IN THE ENVIRONMENT,
Tulane Univ., New Orleans, La. Dept. of Physiology.
N. R. Di Luzio, and T. J. Friedmann.
Nature, Vol 244, No 5410, p 49-51, July 6, 1973. 1 tab, 23 ref.

Descriptors: *Ecological distribution, *Potable water, Environment, *Cities, *Municipal water, Milk, Natural streams, Saline water, Surface waters, Artesian wells, Sodium chloride, Aqueous solutions, Toxins, Aquatic environment, Gulf of Mexico, Mississippi River, Deep water, Potomac River, Colorado River, Lake Michigan.

Identifiers: *Beverages, Biological fluids, *Bacterial endotoxins, Distilled water, Pure water, Dextrose, Baltimore, Chicago, Denver, Galveston, Harrisburg, Hazelton, Kalamazoo, Knoxville, Las Vegas, Little Rock, Los Angeles, Memphis, Mobile, Nashville, New Orleans, Riverside, San Francisco, Washington, D.C., Barataria Bay, Little Dauphin Island Bay, Fort Loudoun Lake,

Mexico City, Cumberland River, South Platte River, Bear Creek, Hatchet Reservoir, Lake Mead, Lake Maumelle, Lake Winona, Mammouth Lake.

Studies were conducted to compare the Gram negative endotoxin content of New Orleans water with that of other cities, as well as the endotoxin distribution in various beverages and biological fluids. Tap water was obtained from various cities and placed in sterile vials. The lysate used was E-Toxate; studies were also carried out with lysate prepared in the laboratory. Samples from cities such as Memphis and Kalamazoo, which derive their water from Artesian wells, were consistently negative. Galveston was an exception to this group. Samples from all other sources were positive. To determine the actual concentrations of endotoxins, samples were serially diluted and duplicate determinations carried out. Tap water in New Orleans and Mobile contained 1 microgram/ml endotoxin compared with 10 micrograms/ml in Denver and San Francisco samples. Surface water samples from the Mississippi River at New Orleans contained 128 micrograms endotoxin per ml whereas samples from deep levels (the source of tap water) contained approximately 400 micrograms/ml. A sample of water from the Gulf of Mexico contained 400 micrograms/ml endotoxin whereas samples from bays off the coast of Louisiana and Alabama contained only 20 micrograms/ml. Tests carried out on biological fluids and beverages showed that chemically pure water, 5 percent dextrose, and sodium chloride solutions were negative for endotoxin. Random samples of beer, cola drinks and wine were also negative. One sample of locally obtained commercial bottled water was positive, but another brand, derived from a 2,000 foot deep Artesian well, was negative. In contrast, Mexico City tap water had an endotoxin content of 800 micrograms/ml. Endotoxin was also found in milk samples from New Orleans. The range was 30 to 130 micrograms/ml. The endotoxin content rose sixteen-fold when milk was maintained at room temperature for 24 h with concomitant bacterial proliferation. No endotoxin alteration was observed when the samples were refrigerated. (Holoman-Battelle)
W74-00618

CONDITION OF COLIFORM ORGANISMS INFLUENCING RECOVERY OF SUBCULTURES ON SELECTIVE MEDIA,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
R. B. Maxcy.

Journal of Milk and Food Technology, Vol 36, No 8, p 414-416, August 1973. 1 tab, 13 ref.

Descriptors: **E. coli*, *Heat resistance, *Stress, Radiation, Sodium chloride, Bioindicators, Coliforms, Sewage bacteria, Cultures, Sewage, Public health.

Identifiers: *Sensitivity, *Selective media, Enrichment, Differential media, Culture media, Enterobacter aerogenes.

The purpose was to determine whether stress treatments, such as are encountered in food processing, influence subsequent cultures of coliforms and to study the conditions required for the progeny to regain normal resistance to selective components of media. Enterobacter aerogenes and one strain of *E. coli* from a culture collection were subjected to heat, radiation, and sodium chloride after which they were grown on plating media. Colonies were then randomly picked and grown in nutrient broth for further comparison of their ability to form colonies on plate count and violet red bile agar. After 6 hr in nutrient broth, average counts on violet red bile agar were less than half those obtained with plate count agar. Sensitivity to the selective medium was lost by repeated transfer and growth in nutrient broth or by repeated picking from the selective medium and subculture of colonies. Cultures with moderate sensitivity to violet red bile

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agar were obtained from raw sewage through picking of colonies from plate count agar. Attempts to obtain a stable sensitive strain through selective enrichment were unsuccessful. A laboratory strain of *E. coli*, with extreme sensitivity to violet red bile agar, however, was used to determine that tolerance was acquired by stepwise adaptation to a selective medium. Occurrence of sensitive coliform cells in nature indicates their potential importance in tests for indicator organisms of public health significance. (Little-Battelle) W74-00621

MOLECULAR RELATIONSHIPS AMONG THE SALMONELLAEE,
Walter Reed Army Inst. of Research, Washington, D.C.
J. H. Cross, D. J. Brenner, W. H. Ewing, and S. Falkow.
Journal of Bacteriology, Vol 115, No 1, p 307-315, July 1973. 3 fig, 4 tab, 23 ref.

Descriptors: *Salmonella, *Enteric bacteria, *Pollutant identification, Biological properties, Classification, Cytological studies, Radioactivity techniques, Aerobic bacteria, *E. coli*, Proteins, Systematics.
Identifiers: *Deoxyribonucleic acid, *Genome, *Chemotaxonomy, Biochemical characteristics, Polynucleotide sequences, Culture media, *Proteus mirabilis*, Arizona.

Polynucleotide sequence relatedness studies were carried out to determine the extent of divergence present in members of the tribe Salmonellae and between salmonellae and other enteric bacteria. Cultures of bacteria were maintained on meat extract of nutrient agar slants. Brain-heart-infusion broth (Difco) was used for routine cultivation of organisms on a dry air rotary shaker at 37°C. For labeling DNA, log-phase cells were suspended in a tris (hydroxymethyl) aminomethane-glucose medium lacking phosphate salts and containing 0.05 percent brain-heart-infusion broth. Carrier-free H₃P-3204 (10-15 mCi) was added, and the cultures were incubated at 37°C with shaking for 16 to 18 h. Both labeled and unlabeled deoxyribonucleic acid (DNA) were prepared by a modification of the method of Berns and Thomas (1969). The estimation of the genome sizes in test organisms was accomplished essentially as described by Gillis, et al. with some modifications. Typical *Salmonella* were 85 to 100 percent related. Two groups of biochemically atypical *Salmonella* showed somewhat lower binding to typical salmonellae and to each other. Arizona were 70 to 80 percent related to salmonellae. Two groups of Arizona were detected. These groups correlated with the presence of monophasic or diphasic flagellar antigens. *Salmonella* and Arizona were no more related to *Citrobacter* than to *Escherichia coli* (45-55 percent). Relatedness of *Salmonella* and Arizona to other enterobacteria ranged from 20 to 40 percent with *klebsiellae* and *shigeliae*, to 20 to 25 percent with *erwiniae*, and to less than 20 percent with *edwardsiellae* and *Proteus mirabilis*. (Holoman-Battelle) W74-00623

FACTORS WHICH INFLUENCE THE ENUMERATION OF *BDELOVIBRIO* BACTERIOVORUS IN SEWAGE AND RIVER WATER,
University of Wales Inst. of Science and Tech., Cardiff.
For primary bibliographic entry see Field 05A.
W74-00624

OXIDATION OF POLYCHLORINATED BIPHENYLS BY ACHROMOBACTER PCB,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
M. Ahmed, and D. D. Focht.

Bulletin of Environmental Contamination and Toxicology, Vol 10, No 2, p 70-72, August 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Oxidation, *Polychlorinated biphenyls, *Microbial degradation, Metabolism, Cultures, Manometers.
Identifiers: *Achromobacter, Dechlorination, Biotransformation, Fate of pollutants.

Resting cell suspensions of *Achromobacter* pCB, which were grown on PCB, were used in tests to determine their ability to metabolize 2,3-DCB, 2,4-DCB, 3,4-DCB, 3,5-DCB, 3,3'-DCB, 3,4,2'-TCB, 2,3,2',3'-TCB, 2,5,3',4'-TCB, and 2,3,4,5,6-PCB. Rates of metabolism were determined manometrically. All compounds except 2,3,3',4'-TCB were oxidized by the organisms. Spectrophotometric analysis of supernatant solutions revealed no chlorides indicating that the organism was unable to dehalogenate the compounds. (Little-Battelle) W74-00632

MONITORING OF DUMPING BY MEANS OF SATELLITE REMOTE SENSING,
Environmental Research Inst. of Michigan, Ann Arbor.

C. T. Wezernak, and F. J. Thomson.
AMBIENT, Vol 2, No 3, p 84-86, 1973. 5 fig, 6 ref.

Descriptors: *Remote sensing, *Monitoring, *Oceans, *Waste disposal, Suspended solids, Sewage sludge, Acidic water, Data processing.

Identifiers: *ERTS, Data interpretation, Multispectral scanner.

Data from the Earth Resources Technology Satellite (ERTS) have been analyzed to evaluate the feasibility of monitoring waste disposal in the oceans. A multispectral aircraft mission was also included to corroborate the results obtained from the ERTS data. ERTS data were obtained at four spectral bands from 0.5 to 1.1 micrometers and clearly show that sewage sludge, acid waste, suspended solids, and major water mass boundaries are observable. The relative depths and dimensions of the waste and dispersal patterns can be determined from the data. It is concluded that satellite remote sensing of large scale events such as ocean dumping is a potential monitoring technique. (Little-Battelle) W74-00635

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-WATER ALGAE: AN EXPERIMENTAL STUDY. II. THE ROLE OF PH AND THE CARBON DIOXIDE-BICARBONATE SYSTEM,

Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W74-00639

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-WATER ALGAE: AN EXPERIMENTAL STUDY. III. EFFECTS OF TEMPERATURE, VITAMIN REQUIREMENTS AND INORGANIC NITROGEN COMPOUNDS ON GROWTH,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W74-00640

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-WATER ALGAE: AN EXPERIMENTAL STUDY. IV. GROWTH OF TEST SPECIES IN NATURAL LAKE WATERS, AND CONCLUSION,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W74-00641

Biodegradation of Nitrilotriacetate (NTA) by Bacteria-I. Isolation of Bacteria Able to Grow Anaerobically with NTA as a Sole Carbon Source,
Karolinska Institutet, Stockholm (Sweden). Dept. of Applied Microbiology.
For primary bibliographic entry see Field 05A.
W74-00644

Biodegradation of Nitrilotriacetate (NTA) by Bacteria-II. Cultivation of an NTA-degrading Bacterium in Anaerobic Medium,
Karolinska Institutet, Stockholm (Sweden). Dept. of Applied Microbiology.
S-O. Enfors, and N. Molin.
Water Research, Vol 7, No 6, p 889-893, June 1973. 3 fig, 3 ref.

Descriptors: *Anaerobic bacteria, *Microbial degradation, *Anaerobic conditions, *Aerobic conditions, Cultures, Nitrates, Nutrient requirements, Nitrates, Isolation, Biodegradation, Nitrilotriacetic acid, Hydrogen ion concentration, Oxidation-reduction potential, Dissolved oxygen, Cultivation.

Identifiers: Substrate utilization, *Culture media, *Degradation rates, Selective media, Characterization, Bacterial physiology.

A nitrilotriacetate (NTA) degrading bacterium which can grow in a salt medium with NTA as the sole carbon source has been cultivated aerobically and anaerobically in a fermentor. The organism needs nitrate for anaerobic growth. The degradation rate is very low during an adaption phase of 40-80 h after onset of anaerobic conditions, but after this the degradation rate increases. Degradation of NTA is accompanied by a pH increase but the cell density increases less than could be expected from the amount of NTA consumed. Traces of nitrite are produced and the concentration reaches a peak when the conditions are changed from aerobic to anaerobic. (See also W74-00644) (Holoman-Battelle)
W74-00645

EFFECT OF TEMPERATURE OF INCUBATION ON PERFORMANCE OF MEDIA IN THE DETECTION OF ENTERIC PATHOGENS,
East Jefferson General Hospital, Metairie, La.
For primary bibliographic entry see Field 05A.
W74-00646

THE STANDING CROP AND PRIMARY PRODUCTIVITY OF THE PHYTOPLANKTON OF ABBOT'S POND, NORTH SOMERSET,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W74-00651

MICROBIOLOGICAL EVALUATION OF COLD-WATER SHRIMP (PANDALUS BOREALIS),
Food and Drug Administration, Boston, Mass.
For primary bibliographic entry see Field 05A.
W74-00653

MICROBIAL FORMATION OF NITROSAMINES IN VITRO,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
A. Ayanaba, and M. Alexander.
Applied Microbiology, Vol 25, No 6, p 862-868, June 1973. 2 fig, 4 tab, 24 ref.

Descriptors: *Yeasts, *Fungi, *Bacteria, *Nitrates, *Cultures, Enzymes, Microbial degradation, *E. coli*, Bioassay, Pseudomonas.

Identifiers: Biosynthesis, *Nitrosamines, Aerobacter aerogenes, *Proteus vulgaris*,

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Streptococcus epidermidis, Bacillus subtilis, Arthrobacter, Nocardia, Aspergillus niger, Aspergillus oryzae, Montierella parvispora, Zygorhynchus moelleri, Trimethylamine, Dimethylamine, N-nitrosodiphenylamine, Diphenylamine, Dialkylamines, Dimethylnitrosamine, Cryptococcus.

Several microorganisms (Aerobacter aerogenes, Proteus vulgaris, Streptococcus epidermidis, Bacillus subtilis, E. coli, Arthrobacter sp., Nocardia sp., Cryptococcus sp., Pseudomonas sp., Aspergillus niger, Aspergillus oryzae, Mortierella parvispora, and Zygorhynchus moelleri) were isolated from garden soil, cow manure, lake water, and municipal sewage for use in experiments to demonstrate the biosynthesis of nitrosamines under conditions where only biological nitrosation could occur. M. parvispora and an unidentified bacterium converted trimethylamine to dimethylamine, and the bacterium (but not the fungus) formed dimethylnitrosamine in the presence of nitrite. Dimethylnitrosamine also appeared in cell suspension of E. coli and S. epidermidis and in hypal mats of A. oryzae incubated with dimethylamine and nitrate. Suspensions of a number of microorganisms produced N-nitrosodiphenylamine from diphenylamine and diphenylamine and nitrate at pH 7.5, and soluble enzymes catalyzing the N-nitrosation of diphenylamine were obtained from two of these organisms. In the presence of these enzymes, several dialkylamines were converted to the corresponding N-nitroso compounds. (Little-Battelle) W74-00654

NEGATIVE CHEMOTAXIS OF MARINE BACTERIA TO TOXIC CHEMICALS,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 05C.
W74-00658

UTILIZATION OF IRON GALLATE AND OTHER ORGANIC IRON COMPLEXES BY BACTERIA FROM WATER SUPPLIES,
Queensland Univ., Brisbane (Australia). Dept. of Microbiology.
I.C. Mac Rae, J.F. Edwards, and N. Davis.
Applied Microbiology, Vol 25, No 6, p 991-995, June 1973. 1 fig, 4 tab, 7 ref.

Descriptors: *Aquatic bacteria, *Microbial degradation, Water supply, Cultures, Biodegradation, Surface waters, Iron, Isolation, Organic compounds, Pseudomonas, Electron microscopy.
Identifiers: *Fate of pollutants, *Substrate utilization, *Organic iron compounds, Iron gallate, Organometallics, Ferric malonate, Ferric malate, Gallic acid, Ferric ammonium citrate, Alcaligenes, Acinetobacter, Vibrio, Moraxella, Culture media, Metal complexes.

The degradation of four soluble organic iron compounds by bacteria isolated from surface waters and the precipitation of iron from these complexes by the isolates was studied. All eight isolates brought about the precipitation of iron when grown on ferric ammonium citrate agar. Three isolates were able to degrade ferric malonate, and three others degraded ferric malate with iron precipitation. Only three isolates, two strains of Pseudomonas and one of Moraxella, were able to degrade gallic acid when this was supplied as the sole carbon source. One strain of Pseudomonas was found to be active in degrading ferric gallate. Electron microscopy of cells of this bacterium after growth in ferric gallate as the sole carbon source yielded results indicating uniform deposition of the iron on or in the bacterial cells. Seven of the isolates could degrade the iron gallate complex if supplied with additional carbon in the form of yeast extract. (Holoman-Battelle) W74-00660

A COMPARISON OF THE DISTRIBUTION OF INTESTINAL BACTERIA IN BRITISH AND EAST AFRICAN WATER SOURCES, Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.

L.M. Evison, and A. James.

Journal of Applied Bacteriology, Vol 36, No 1, p 109-118, March 1973. 7 tab, 23 ref.

Descriptors: *Enteric bacteria, *Pathogenic bacteria, *Ecological distribution, Water pollution, Bioindicators, Pollutant identification, Sewage effluents, Soils, Aerobic bacteria, E. Coli, Coliforms, Soil environment, Vegetation, Aquatic environment, Domestic wastes, Milk, Farm wastes, Sewage treatment, Africa, Water temperature.

Identifiers: *Kenya, *England, Culture media, Serotypes, Fecal streptococci, Lactobacillus spp., Salmonella spp., Enumeration, Klebsiella spp., Yogurt, Citrobacter freundii, Klebsiella aerogenes, Proteus spp., Survival.

Vrious workers have suggested that there are marked regional variations in the distribution of intestinal bacteria used as indicators of pollution in water supplies. Results are presented of investigations into the distribution of some intestinal indicators (coliforms, Escherichia coli, faecal streptococci and anaerobic lactobacilli) in water sources in the United Kingdom and in Kenya. The surveys showed that the differences in distribution were not significant except for some coliforms (Citrobacter and Klebsiella spp.), but that survival subsequent to excretion was affected by ambient temperature. (Holoman-Battelle) W74-00662

A MEDIUM FOR COUNTING AQUATIC HETEROTROPHIC BACTERIA IN POLLUTED AND UNPOLLUTED WATERS,
University of Wales Inst. of Science and Tech., Cardiff.
D.G. Staples, and J.C. Fry.

Journal of Applied Bacteriology, Vol 36, No 1, p 179-181, March 1973. 1 tab, 12 ref.

Descriptors: *Aquatic bacteria, *Pollutant identification, *Sewage effluents, Water pollution, Natural streams, Cultures, Pollutants, Water sampling, Lakes, Rivers.

Identifiers: *Counting, *Heterotrophic bacteria, *Casein peptone starch medium, Culture media, Culturing techniques, River Kenson, River Ely, Nutrient agar, Plate counts, Sodium caseinate, Yeast extract, Iron peptone, River water agar, Sewage extract agar.

Casein-peptone-starch (CPS) medium was compared with 8 other media for counting heterotrophic bacteria in polluted and unpolluted surface waters. Samples were taken in sterile glass bottles, shaken 20 times, diluted with sterile river water, and appropriate dilutions were plated in triplicate by the spread plate techniques. The plates were incubated at 20 degrees for 10 days; colonies were counted on plates showing 30-300 colonies/plate. The results confirm that for clean and polluted rivers CPS is more suitable for counting freshwater bacteria than are the recommended media, including that of the American Public Health Association (1965). (Holoman-Battelle) W74-00663

DEGRADATION OF CHLORINATED HYDROCARBONS BY CLOSTRIDIUM SP. ISOLATED FROM LINDANE-AMENDED, FLOODED SOIL.

Central Rice Research Inst., Cuttack (India).

N. Sethunathan, and T. Yoshida.

Plant and Soil, Vol 38, No 3, p 663-666, June 1973. 2 tab, 7 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Clostridium, *Soil bacteria, *Microbial degradation, Soil contamination, Insecticides, Anaerobic

bacteria, Isolation, Biodegradation, Heptachlor, Radioactivity techniques, Anaerobic conditions. Identifiers: *Lindane, *Flooded soil, Flooded conditions, Methoxychlor, Degradation products.

A Clostridium sp., isolated from flooded soil amended with lindane (gamma-BHC), decomposed methoxychlor, gamma-BHC and heptachlor in that order under anaerobic condition. During the bacterial degradation of ring-labelled C-14-gamma-BHC, there was a net loss of radioactivity from the reaction mixture. Release of C1402 during the degradation of C-14-gamma-BHC was negligible. Methane was not detected as an end product of gamma-BHC breakdown. (Holoman-Battelle) W74-00664

INTERMEDIA ASPECTS OF AIR AND WATER POLLUTION CONTROL,

Stone (Ralph) and Co., Inc., Los Angeles, Calif.

R. Stone, and H. Smallwood.

Copy available from GPO Sup Doc as EPI.23 600-73-003, \$3.25; microfiche from NTIS as PB-224 812, \$1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-73-003, August 1973. 356 p, 30 fig, 51 tab, 411 ref. EPA Program Element 1H1093, 68-01-0729.

Descriptors: *Water pollution, *Air pollution, Water pollution control, Water pollution sources, California, *Path of pollutants, Costs, Waste disposal, Waste water treatment, *Air-water interfaces.

Identifiers: *Intermedia pollution control, Intermedia transfer.

Current National intermedia pollutants (air, water, and residues) and strategies for their control were evaluated. Major intermedia pollutants in both air and water were identified. The principal sources of direct intermedia pollutant transfer were identified as incineration, wastewater processing, NO from water chlorination, sludge processing, release of radioactive gases (water-to-air); scrubbers, cleaning equipment, and regeneration of activated carbon (air-to-water). Indirect sources were identified as replacement of fossil fuel by nuclear energy, wastes generated by pollution-control equipment manufacture, and water recycling. Residue disposal problems were found to include landfill gas and leachate contamination, limited disposal sites, and increasing costs. Techniques of controlling intermedia pollutant transfer were found to include prevention, removal, recovery, and conversion; choice between these was found to depend on factors such as physical location, cost, and acceptability. Strategies for preventing intermedia transfer were found to include regulatory (restrictive and prohibitive), economic (incentives and sanctions), and educational. A mathematical model was developed and a gross California South Coast Basin Study conducted. (EPA) W74-00703

QUALITY MANAGEMENT FOR WISCONSIN: A REPORT ON PRESERVING AND IMPROVING THE QUALITY OF THE AIR, LAND AND WATER RESOURCES.

For primary bibliographic entry see Field 05G.

W74-00715

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,

Utah Water Research Lab., Logan.

For primary bibliographic entry see Field 05C.

W74-00720

ON ADVECTION IN PHYTOPLANKTON MODELS,

Florida State Univ., Tallahassee. Dept. of Meteorology.

For primary bibliographic entry see Field 05C.

W74-00737

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

RECONNAISSANCE ANALYSIS OF EFFECTS OF WASTE-WATER DISCHARGE ON THE SHALLOW GROUND-WATER FLOW SYSTEM, LOWER LAS VEGAS VALLEY, NEVADA, Nevada Univ., Reno. Center for Water Resources Research.

J. A. Westphal, and W. E. Nork.

Project Report No. 19, April, 1972. 37 p, 23 fig, 3 tab, 18 ref. EPA Project 13030 EQB.

Descriptors: *Waste water (Pollution), *Dispersion, *Seepage, *Water pollution, *Effluent, Industrial wastes, Municipal wastes, Hydrology, *Nevada, Model studies.

Identifiers: Chemical responses, Digital simulation models, Analog simulation models, *Las Vegas Valley (Nev).

Analog and digital simulation techniques were used in this quantitative analysis of the effect of effluent disposal on the shallow ground-water flow system in the Henderson-East Las Vegas area of Las Vegas Valley. Modeling results indicate that approximately 3600 acres of the shallow flow system in the vicinity of, and down gradient from, surface disposal sites near Henderson may be influenced by surface spreading of industrial and municipal effluent. As much as 70% of this effluent may further percolate downward into underlying fine-grained sediments. Cessation of surface disposal of effluents, however, would result in an ultimate decrease in flow in Las Vegas Wash amounting to about 5 cubic feet per second. Water quality is extremely variable within the study area. In the immediate vicinity of BMI disposal sites, effluent percolating into the shallow sediments is not in chemical equilibrium with the geological materials. Except on the western periphery of the study area, analyses from shallow piezometers show that shallow ground water has been influenced by effluent disposal. Virtually all shallow ground water in the study area is ultimately influenced by disposal of either industrial or municipal effluent. (Hoffman-North Carolina)

W74-00748

PROJECT REPORT FOR VENTURA COUNTY PLANNING DEPARTMENT AND CASITAS MUNICIPAL WATER DISTRICT ON WATERSHED DEVELOPMENT IMPACT ON LAKE CASITAS. Montgomery Research, Inc., Pasadena, Calif.

Summary Report. March, 1972. 20 p, 1 fig.

Descriptors: *California, *Planning, Land use, *Water quality, Environmental effects, *Reservoirs, *Eutrophication, Water pollution effects, Water supply, Urbanization, Multiple-purpose reservoirs, Zoning, Recreation demand, Monitoring, Waste water treatment.

Identifiers: *Lake Casitas (Calif), Ventura County (Calif.), Development alternatives, Reservoir degradation.

An investigation of potential lake water quality changes resulting from various hypothetical watershed development alternatives was conducted for Lake Casitas, a multiple-use reservoir constructed in 1959 by the Bureau of Reclamation and located in the southwest corner of Ventura County (Calif.). It supplies potable water to part of the county, provides recreational activity and scenic attraction, and assists in flood control. The approach involved (a) defining water quality objectives for the lake; (b) identifying sources of pollution from specific development alternatives; (c) evaluating effects of probable pollutants on water quality; and (d) evaluating pollution prevention methods. Conclusions based on existing data are that Lake Casitas would experience serious problems of eutrophication by 1990 if development occurs by any of the 8 identified alternatives: (1) regional park urbanization, (2) low density urbanization, (3) urbanization medium density, (4) regional park, (5) estate development, (6) dry farming, (7) irrigated farming, and (8) high density urbanization. Thus none of these developments

should be implemented now. More restrictive forms of development are not ruled out. Numerous other findings relating to climatology, hydrology, geology and soils of the Casitas Basin, water quality and life expectancy of Lake Casitas, the use and condition of the watershed and lake are included. Additional data collection, monitoring and research on environmental quality, and investment in environmental control and protection measures are recommended. (Edwards-North Carolina)

W74-00752

REDUCING EVAPORATION PLANT POLLUTION PLANT POLLUTION AND ITS TREATMENT,

Rosenlew (Oy. W.) A.B., Pori (Finland).

For primary bibliographic entry see Field 05D. W74-00763

KRAFT PULPERS AND POLLUTION PROBLEMS AND PRESCRIPTIONS,

For primary bibliographic entry see Field 05D. W74-00774

EVAPORATION RATES OF LIQUID HYDROCARBON SPILLS ON LAND AND WATER,

Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.

D. Mackay, and R. S. Matsugu.

Canadian Journal of Chemical Engineering, Vol 51, No 4, p 434-439, August 1973. 6 fig, 20 ref.

Descriptors: *Oil spills, *Oily water, *Evaporation, *Mass transfer, *Heat transfer, *Mathematical studies, *Theoretical analysis, Equations, Wind velocity, Kinetics, Temperature, Correlation analysis, Turbulence, Turbulent boundary layers.

Identifiers: Schmidt Number, Cumene, Hydrocarbons.

Mass and heat-transfer processes occurring during the evaporation of petroleum oil spills are described. Equations are developed which permit predictions of liquid temperature and evaporation rates. Experimental determinations of evaporation rates for cumene, water, and gasoline were used to calculate the evaporative mass-transfer coefficients which were then correlated with wind speed, liquid pool size, and vapor-phase Schmidt Number. Good agreement was found between experimental and computed cumene temperature and evaporation rates. The correlation was compared with that for flat-plate mass transfer and showed good agreement, suggesting that turbulent transfer occurs at a rate which is enhanced by the liquid surface roughness. The more complicated problem of estimating the evaporation rates of hydrocarbon mixtures, as in oil spills, is also broached. (Brown-IPC)

W74-00775

A NEW ERA FOR COOLING WATER TREATMENT,

Betz Labs., Inc., Trevose, Pa.

For primary bibliographic entry see Field 05D. W74-00777

INFLUENCE OF EVAPORATION CONDENSATE ON BIOLOGICAL PURIFICATION OF PULP WASH WATERS (EINFLUSS VON EIN-DAMPFKONDENSAT AUF DIE BIOLOGISCHE REINIGUNG VON ZELLSTOFFWASCHWASSEN).

Technische Universitaet, Dresden (East Germany).

For primary bibliographic entry see Field 05D. W74-00781

SWITCHING FROM CALCIUM BISULFITE TO TWO-STAGE SODIUM-CALCIUM BISULFITE PULPING TO REDUCE WATER POLLUTION (ZNIEZENIE ZNECISTENIA ODPADNYCH VOD PRECHODOM Z CA-BISULFITOVOHO VARENIA NA DVOJSTUPNOVE NA-CA-BISULFITOVO).

Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).

For primary bibliographic entry see Field 05D.

W74-00789

OXYGEN-CONSUMING ORGANIC MATTER (BOD) IN EFFLUENTS ORIGINATING IN DIFFERENT PULPING PROCESSES OF THE WOODWORKING INDUSTRY: REVIEW OF LITERATURE DURING THE YEARS 1960-1970, Finnish Pulp and Paper Research Inst., Helsinki. H. Totterman.

Paperi ja Puu (Papper och Tra), Vol 54, No 8, p 437-449; No 9, p 505-508, 511-516; No 10, p 628-630, 633-636, Aug., Sept., and Oct. 1972. 8 tab, 15 diag, 54 ref.

Descriptors: *Pulp wastes, *Water pollution sources, *Biochemical oxygen demand, *Waste water (Pollution), Industrial wastes, Pulp and paper industry, Effluents, Reviews, Sulfite liquors, Bleaching wastes.

Identifiers: Kraft mills, Sulfite mills, NSSC mills.

This literature review presents information on the BOD loads of industrial effluents from unbleached and bleached kraft, sulfite (including bisulfite), and neutral sulfite semichemical pulp mills and wallboard factories. Actual BOD data are tabulated in chronological order of reference citations, and diagrams are included to compare the effects of modern against older manufacturing technologies on effluent BOD loads. (Brown-IPC)

W74-00793

ENVIRONMENTAL HEALTH ANALYSIS.

Saginaw County Metropolitan Planning Commission, Mich.

January 1, 1972. 194 p, 24 fig, 12 tab. HUD CPA-MI-05-28-0317.

Descriptors: *Comprehensive planning, *Data collections, *Environmental sanitation, Air pollution, Water pollution, Michigan, Solid wastes, Regional development, Regional analysis, Administration. Identifiers: *Saginaw County (Michigan).

The Saginaw County (Michigan) Metropolitan Planning Commission inventoried and analyzed existing environmental conditions of air and water pollution, solid waste management, land use, and housing conditions. Local, state, and federal actions toward these areas were studied and solutions and alternatives to correcting problems are suggested. The 1960 population of the study area was about 190,750 and is expected to grow to about 312,000 by 1990. Economic growth is expected to exceed the national average and to be primarily in the area of manufacturing specialization. As a result of the study, 16 specific recommendations were made. These include: (1) promotion of consolidation and designation of environmental responsibilities, (2) promotion of public information on environmental matters, (3) creation of an advisory council for environmental quality, (4) implementation of a country-wide coordinated environmental program, (5) creation of units larger than the county level for environmental problems including more than one county, (6) promotion of a State air pollution control program, and (7) promotion of greater State and Federal funding for environmental programs. (Poertner)

W74-00808

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

CARGO SPILL PROBABILITY ANALYSIS FOR THE DEEP WATER PORT PROJECT, Woodward-Lundgren and Associates, Oakland, Calif.

K. Nair, H. C. Shah, W. S. Smith, and D. S. Shah. Available from NTIS Springfield, Va. 22151 as AD-758 330 Price \$3.00 printed copy; \$1.45 microfiche. Contract report for Corps of Engineers, February 1973. 132 p, 11 fig, 18 tab, 79 ref, 4 append. DACW61-73-C-0349.

Descriptors: *Water pollution sources, *Oil spills, *Ships, Forecasting, Harbors, Transportation, Oil industry, Model studies, Probability, Methodology, Analytical techniques.

Identifiers: *Oil spill probability, Oil tankers, Tanker loading, Tanker unloading.

A probability model for predicting the occurrence of liquid cargo spills from tankers was developed and quantified using a Bayesian statistical approach. The probability model considers the size, cause, and location characteristics of cargo spills. The probabilistic values were derived from subjective information obtained from people knowledgeable of tanker operations and the associated likelihood of cargo spills. Subjective information was also obtained regarding the influence of supertankers on the future probability of cargo spills. The results have allowed definition of the probable size, cause, and location of cargo spills. If a cargo spill occurs, its most probable size is less than one long ton, its cause human error, and it occurred at dock during loading and unloading operations. The most probable location of the larger size spills is at entrances to ports and coastal areas. (Woodard-USGS)

W74-00819

BIOLOGICAL INVESTIGATIONS OF LAKE WINGRA, Wisconsin Univ., Madison. Lab. of Limnology. For primary bibliographic entry see Field 05C.

W74-00833

REGIONAL POLLUTION STUDY: INVENTORY AND ANALYSIS.

Tulsa City-County Health Dept., Okla. Environmental Health Div.

Available from NTIS, Springfield, Va. 22151 as PB-218 076 - Price \$5.25 printed copy; \$1.45 microfiche. Indian Nations Council of Governments report, June 1972. 59 p, 1 fig, 11 tab, 5 ref. HUD CPA OK 0656 1012.

Descriptors: *Environmental control, *Water pollution control, *Air pollution, *Water pollution sources, Census, Computer programs, Systems analysis, Industrial wastes, Municipal wastes, Solid wastes, Treatment facilities, Data collections, Planning, Reviews.

Identifiers: *INCOG Environmental Pollution inventory.

This study is a preliminary inventory and analysis of the data contained in the Indian Nations Council of Governments (INCOG) Environmental Pollution File. A more complete analysis and use of the data in systems models will be made when the file is complete. It is intended that the file be a day-to-day operational tool for INCOG and other governmental departments for assessing the impact to the environment resulting from proposed community developments, both public and private. To be functional, the file must be updated continuously. A computer file is developed which contains information with respect to environmental protection by providing inventories of emissions to the ambient atmosphere, effluents to the streams, industrial wastewater sources, potable water sources and treatment plants, and solid waste collection systems and disposal sites. Summaries of the inventories and a preliminary analysis of the data are included. (Woodard-USGS)

W74-00849

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,

Eastern New Mexico Univ., Portales.

R. G. Taylor, and P. D. Bigbee.

Water Research, Vol 7, No 8, p 1155-1161, August 1973. 1 fig, 4 tab, 9 ref. OWRR A-034-NMEX (5).

Descriptors: *Nitrates, *Tracers, *Water pollution sources, *Fertilizers, *Farm wastes, Arid lands, *New Mexico, Return flow, Path of pollutants.

Nitrate concentrations were studied to demonstrate their applicability to examining agriculture practices which contaminate groundwater. Areas treated with nitrogenous fertilizers and subsequently irrigated have variations in nitrate content related directly to irrigation seasons. Agricultural industries with high animal densities and high water consumption for maintenance, were found to have high, but nonfluctuating nitrate concentrations. Areas with high animal density with low water usage for maintenance, areas with low animal density per land area, and agricultural practices for which little or no nitrogenous fertilizers were used demonstrated low aquifer nitrate concentrations regardless of water usage. (Knapp-USGS)

W74-00850

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY—PROCESSES AND RESOURCES, VOLUME II.

Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.

W74-00891

NANNOPLANKTON OF THE CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Botany; and Maryland Univ., Solomons. Natural Resources Inst.

For primary bibliographic entry see Field 02L.

W74-00895

SUBMERGED VASCULAR PLANTS OF THE CHESAPEAKE BAY AND TRIBUTARIES,

American Univ., Washington, D.C. Dept. of Biology.

For primary bibliographic entry see Field 02L.

W74-00901

EMERGENT VASCULAR PLANTS OF CHESAPEAKE BAY WETLANDS,

Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.

For primary bibliographic entry see Field 02L.

W74-00902

VASCULAR PLANTS OF THE CHESAPEAKE BAY,

Maryland Univ., College Park. Dept. of Botany.

For primary bibliographic entry see Field 02L.

W74-00903

INTERACTION OF NITRILOTRIACETIC ACID WITH SUSPENDED AND BOTTOM MATERIAL.

National Bureau of Standards, Washington, D.C.

Analytical Chemistry Div.

For primary bibliographic entry see Field 05A.

W74-00926

DYNAMIC WATER QUALITY FORECASTING AND MANAGEMENT,

Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.

For primary bibliographic entry see Field 05C.

W74-00927

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT SULFATE-REDUCING BACTERIA (BUT WERE AFRAID TO ASK), D. P. Johnston.

Baroid News Bulletin, Vol 24, No 1, p 15-19, 1973. 2 fig.

Descriptors: *Wells, Water wells, Oil wells, *Bacteria, Water analysis, *Bactericides, *Corrosion, Pitting, Chemical reactions, Hydrogen ion concentration, Sulfur bacteria.
*Sulfate-reducing bacteria, *Desulfovibrio, Electrochemical corrosion.

Microorganisms cause problems throughout the petroleum industry. Several types of bacteria have been implicated; undoubtedly, the most troublesome organism is the sulfate-reducing organism, Desulfovibrio. Sulfate-reducing bacteria have a world-wide distribution, and exist in a variety of environments including drilling fluids, water-injection systems, gas storage reservoirs, and producing formations. These widespread organisms are physiologically unique in that they reduce sulfate to sulfide, the latter being well known for its role in the corrosion process. Laboratory personnel are working toward a better understanding of the science of petroleum microbiology. Sulfate-reducing bacteria have been studied in great detail, and chemicals to control this troublesome organism are marketed under the SURFLO trademark. (Campbell-NWWA)

W74-00942

WELL CONSTRUCTION HELPS DETERMINE WATER QUALITY,

Agricultural Research Service, Beltsville, Md. Farmstead Water Systems Research.

E. E. Jones, Jr.

Journal of Environmental Health, Vol 35, No 5, p 443-450, March-April, 1973. 15 fig, 2 tab, 3 ref.

Descriptors: *Design, Water Supply, *Water pollution, Contamination, *Groundwater, Agricultural chemicals, Path of Pollutants, *Pesticide residues, Coliforms, Dispersion, Water quality.

Identifiers: Agricultural research service, *Locating sanitary defects.

Information gained on the relationship between well construction and water quality in trying to determine the paths of entrance into, and the means of excluding, pesticides from wells is presented. Three farmstead water supply wells characterized by an obvious lack of adequate sanitary protection are described. When wells of this nature are identified, reconstruction or abandonment and proper closure is emphasized. Factors contributing to non-uniform contamination of a well are identified. Deterioration of ground water quality with respect to the entrance of surface water into a well is discussed. A need for study of wells apparently having adequate sanitary protection but showing signs of surface contamination, rapid changes in water quality with rainfall, bacterial contamination, turbidity, and/or the presence of pesticides is stressed. (Campbell-NWWA)

W74-00954

SIGNIFICANCE OF DOCKS IN DISSEMINATION OF DIPHYLLOROTHRIASIS NEAR RIVERS AND LARGE TRANSPORT WATER BODIES (ACCORDING TO DATA FROM THE VOLGA PIERS AND THE VOLGOGRAD RESERVOIR), (IN RUSSIAN), Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).

For primary bibliographic entry see Field 05C.

W74-00991

BETA RADIOACTIVITY OF PERiphyton IN CERTAIN DAM RESERVOIRS,

Institut Gospodarki Komunalnej, Chorzow (Poland). Zaklad Radiol. GOP.

J. Kwapinski.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

Acta Hydrobiol. Vol 14, No 3, p 273-286, 1972, Illus.
Identifiers: Dams, *Periphyton, *Radioactivity,
*Reservoirs, Beta radioactivity.

Investigations permitted the distinction of the period of maximum beta radioactivity, observed in the period of increased radioactivity of the water. The cumulation coefficient in the examined limnic and rheolimnic reservoirs is of the order, 1000-10000.—Copyright 1973, Biological Abstracts, Inc. W74-00993

OPTIMIZATION OF SURFACE-WATER QUALITY: A PROPOSAL FOR SOLVING A FUTURE PROBLEM (IN GERMAN)

Frankfurt Univ. (West Germany). Hygiene-Institut.

R. H. W. Schubert.

Zentralbl Bakteriol Parasitenkd Infektionskr Hgy Erste Abt Orig Reihe B Hyg Praev Med, Vol 155, No 3, p 248-255, 1971, English summary.

Identifiers: Flow, *Optimization, Pollution, River, *Sewage disposal, Surface waters, *Waste transport, Water quality, *Regional analysis.

It is not possible to solve the current environmental problems with conventional methods; they must be treated regionwise, using a model to simulate the conditions present. Based on functions which flowing waters will be having in the Central European civilization and economy, quality of the water and sewage disposal are discussed. Shortcomings of the current system have led to inadequate economy of flowing waters. Classification of waste products, and regulations for the discharge of sewage into running waters are necessary to use flowing waters optimally for waste transport and to provide for sufficient stretches necessary for self purification of the water. Toxic substances and compounds which do not readily disintegrate may be discharged into flowing water only at moderate amounts which do not impair self purification. Medium and readily disintegrable substances should be discharged only at amounts which do not exceed the maximum permissible load on the river water. The principles of a mathematical model are explained, whereby a river is simulated from its source to its mouth, which aids optimization waste transport, self purification, and water quality.—Copyright 1973, Biological Abstracts, Inc. W74-00994

EXPERIMENTAL DATA ON THE SORPTION CAPACITIES OF WATER BEARING STRATA AND SURVIVAL OF *ESCHERICHIA COLI* DURING BACTERIAL CONTAMINATION OF GROUND WATER (IN RUSSIAN)

Institute of General and Municipal Hygiene, Moscow (USSR).

B. M. Kudryavtseva.

Gig Sanit, Vol 37, No 7, p 19-23, 1972, Illus., English summary.

Identifiers: Bacterial contamination, *E. coli, *Groundwater contamination, *Sorption capacities, Strata, *Filtration, Water pollution sources.

A filtration installation was studied. The adsorption process was an important factor in the bacterial self purification of ground water and promoted a longer survival of bacteria. In fine-grain sand, E. coli survived up to 200 days and could be a potential hazard for ground water contamination.—Copyright 1973, Biological Abstracts, Inc. W74-01002

CIRCULATION IN THE BAY OF AMPASINDAVA (MADAGASCAR) AND ITS BIOCHEMICAL IMPLICATIONS (IN FRENCH)

Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be. Y. Magnier, and B. Piton.

Cah O R S T O M (Off Rech Sci Tech Outre-Mer) Ser Oceanogr, Vol 10, No 1, p 75-97, Illus, 1972, English summary.

Identifiers: Bays, Biochemical studies, *Circulation (Estuarine), *Madagascar (Ampasindava Bay), *Oxygen, *Salinity, Estuarine environment, Path of pollutants.

After a 1 yr survey, it appears that the main dynamic feature of the Ampasindava Bay, Madagascar is the estuarine circulation through the rainy season, resulting in the production of bottom water with low O₂ and high nutrient salt values. During the dry season, as the estuarine circulation weakens greatly, the salinity becomes homogenous and the nutrients almost disappear. Two tentative methods for transport estimation are proposed and discussed.—Copyright 1973, Biological Abstracts, Inc. W74-01005

FOUR METASAPROBIC COMMUNITIES OF COLORLESS FLAGELLATES, V. Sladeczek.

Arch Protistenkd, Vol 114, No 1/2, p 245-248, 1972, Illus.

Identifiers: Bodonetum-putrini, *Flagellates, Hexamitum-inflati, Oicomonaedatum-socialis, *Polytometum-uvellae, *Metasaprobic communities, Sewage, Bacteria.

Four successive communities of colorless flagellate saprobes are described: Polytometum uvellae, Hexamitum inflati, Oicomonaedatum socialis and Bodonetum putrini. There is a direct succession between the 2 first named communities, P. uvellae being a pioneer association in decaying municipal sewage. All 4 associations belong to the formation Bacterio-Zooflagellation.—Copyright 1973, Biological Abstracts, Inc. W74-01006

SILICATE IN THE WATER OF THE BAY OF VIGO (IN SPANISH)

Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.

For primary bibliographic entry see Field 02L. W74-01007

STUDIES OF BIOLOGICAL ENERGY BALANCE AND BIOLOGICAL PRODUCTIVITY IN THE USSR LAKES (IN RUSSIAN)

For primary bibliographic entry see Field 02H. W74-01009

ENVIRONMENTAL IMPACT STUDY FOR EXPANSION ON THE VILLAGE CREEK SEWAGE TREATMENT PLANT,

Advanced Technology Center, Inc., Dallas, Tex. For primary bibliographic entry see Field 05D. W74-01035

STREAM AND LAKEFRONT FIELD INVENTORY, VOLUME I - SUMMARY.

Lorain County Regional Planning Commission, Elyria, Ohio.

Lorain County Water Pollution Study Report No. 12. 1967. 227 p, 9 fig, 20 plates, 169 tab, 3 ref, 6 append.

Identifiers: *Water quality, *Water pollution sources, *Data collections, *Ohio, Odor, Color, Water sampling, On-site investigations, On-site data collections.

Identifiers: *Lorain County (Ohio), Lake Erie, Black River.

A graphic presentation is provided of water quality data collected in 1966-1967 for Lorain County, Ohio. The field inventory was designed to determine

mine the general nature of the water pollution problem in the county and was particularly interested in the location of polluted waters, the origin of the pollutants and the estimated discharge. The emphasis was on the aesthetic nature of the pollution rather than on laboratory analyses and physical/chemical properties. Thus, one output of the inventory is the identification of points where water samples should be taken and tested and specific problem locations. Most of these points are concentrated on the Black River and the Lake Erie waterfront. Almost 2,000 wastewater outlets and/or specific wastes were identified. The largest sources of wastewater were cooling water discharges from electric power and steel industries. Tables of summary data for specific locations throughout the county are included. Pollution is worst on the main stem of the Black River and the Lake Erie waterfront since most industrial and municipal discharges are concentrated in these areas. (Elfers-North Carolina) W74-01046

SEEPAGE FLOWS—FIELD DATA MEASUREMENTS FOR EVALUATION OF POTENTIAL CONTRIBUTION OF FERTILIZERS TO GROUNDWATER POLLUTION,

Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.

L. Michna, and E. L. Bourdinos.

Soil Science, Vol 115, No 6, p 401-408, June 1973.

5 fig, 12 ref. OWRR A-027-NJ (2).

Identifiers: *Leaching, *Path of pollutants, *Fertilizers, Nitrates, *New Jersey, Groundwater movement, Data collections, Permeability, Isotropy, *Seepage.

Losses from nitrogen fertilizers into natural waters are largely as nitrates and can occur both through leaching and surface runoff. Several approaches are currently being used to attack this problem. All have the advantage of obtaining data under actual field conditions. Field data taken at the Adelphia Experimental Station of Rutgers University include soil permeability, groundwater hydraulic gradients, and seepage velocities. The flow field characteristics are determined by measuring groundwater table fluctuations and by evaluating the coefficient of permeability. Groundwater fluctuations are measured through a continuous monitoring and determination of the piezometric grade line. The coefficient of permeability is measured by means of tube and auger hole methods. The coefficient of permeability for this particular soil condition (mixture of fine sand and silt) practically does not change within the observed depth of groundwater table fluctuations. A pumping test is underway for verification of the coefficient of permeability by direct evaluation of the flow rate (and thereby discharge velocity), the hydraulic gradient, and pollutant concentration measurements. (Knapp-USGS) W74-01054

BOTTOM FAUNA OF DEAD VISTULA,

Warsaw Univ. (Poland). Zoological Inst.

For primary bibliographic entry see Field 05C. W74-01073

MOVEMENT OF SALT AND WATER IN RELATIVELY DRY SOILS,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.

For primary bibliographic entry see Field 02G. W74-01088

PRIMINARY SYSTEM DEVELOPMENT, CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),

Little (Arthur D.), Inc., Cambridge, Mass. D. S. Allan, G. H. Harris, G. R. Schimke, and R. W. Neal.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

Descriptors: *Water pollution, *Chemical wastes, *Warning systems, Hazards, Safety, Toxicity, Water pollution control, Discharge (Water).
Identifiers: Emergency response, Hazardous chemicals, Accidental chemical releases.

A Chemical Hazards Response Information System (CHRIS) is designed to satisfy the information needs of Coast Guard field personnel when responding to emergencies involving the accidental release of hazardous chemicals into water. It will also serve nonemergency needs as they apply to the development of improved safety in the water transport of hazardous chemicals. CHRIS consists of the organization and facilities necessary for the system development and operation, and five hard-copy reference guides (or manuals) containing chemical-specific data, local information on vulnerable life forms and property and response resources, hazard assessment procedures, and response methods. These data bases are augmented with a computerized hazard assessment system. (Woodard-USGS)
W74-01092

5C. Effects of Pollution

A EUTROPHICATION MODEL OF THE WHITE RIVER BASIN ABOVE BEAVER RESERVOIR IN NORTHWEST ARKANSAS,

Arkansas Univ., Fayetteville. Dept. of Civil Engineering.

R. A. Gearheart.

Available from the National Technical Information Service as PB-224 811, \$7.50 in paper copy, \$1.45 in microfiche. Arkansas Water Resources Research Center, Fayetteville Publication No. 15, 1973. 100 p, 6 fig, 23 tab, 47 ref, 3 append. OWRR B-012-ARK (4). 14-01-0001-1877.

Descriptors: *Eutrophication, Nutrients, *Nitrogen, *Phosphorus, Urban runoff, Growth rates, *Arkansas, Model studies, Agricultural runoff.

Identifiers: *Beaver Reservoir (Ark), *White River basin (Ark), *Algal growth rates, Nutrient budget.

The purpose of this investigation was threefold: (1) to determine the rate of nutrient accumulation in Beaver Reservoir, (2) to develop a eutrophication model to predict future eutrophication levels, and (3) to identify and isolate the major nutrient contributors of Beaver Reservoir. Stream and reservoir sampling networks were established and monitored for the various forms of soluble nitrogen and phosphorus. A nutrient budget for Beaver Reservoir was determined, and the rate of nutrient accumulation calculated from the nutrient inflow and outflow rates. The major nutrient contributors were based on the various types of runoff (i.e., agricultural and urban runoff occurring around the reservoir). These were ranked according to the amount contributed to total nutrient inflow. Overall algal growth rates for the six Beaver Reservoir sampling stations were developed from a reservoir model equation. Various parameters which influence algal growth were regressed to establish an overall rate equation. Other prediction equations were established for regression for nutrient loadings from major nutrient contributors. (Babcock-Arkansas)
W74-00555

STUDIES ON BRACKISH WATER PHYTOPLANKTON,

North Carolina Univ., Chapel Hill. Dept. of Botany.

P. H. Campbell.

Available from NTIS, Springfield, Va., 22151 as COM73-10672 Price \$6.00 printed copy; \$1.45 microfiche. North Carolina University Sea Grant Publication UNC-SG-73-07, March 1973. 406 p.

Descriptors: *Phytoplankton, *Systematics, *Estuaries, *Ponds, *Water pollution effects, Aquatic life, Environmental effects, Salinity, Sewage effluents, Fish, Ecosystems, Ecosystems, Ecology, Growth rates, Nutrients, Diatoms, Water temperature, Dissolved oxygen, Light penetration, Hydrogen ion concentration, Classification.
Identifiers: *Taxonomy.

This study on brackish water phytoplankton contains 2 reports. In the first report the phytoplankton of Gales Creek, a small shallow coastal plain estuary near Morehead City, N. C., was studied for over a year. Special emphasis was placed on determining the species composition and distribution patterns of the phytoplankton and in measuring environmental factors which may influence the presence and distribution of these species. In the second report, polluted brackish ponds were found to support a high level of primary productivity with sewage plant effluent, but whether this productivity can be converted to a dependable harvest remains to be seen. So far, the production of blue crabs in the ponds has been too low for commercial interest, the palaeomonetes shrimp that grew well are not valued as human food, the edible fish did not grow. The system was strongly taxed by very dense phytoplankton concentrations, primarily of a single species. (See W74-00590 and W74-00591) (Woodard-USGS)
W74-00589

THE PHYTOPLANKTON OF GALES CREEK WITH EMPHASIS ON THE TAXONOMY AND ECOLOGY OF ESTUARINE PHYTOFLAGELLATES—PART 1 OF STUDIES ON BRACKISH WATER PHYTOPLANKTON,

North Carolina Univ., Chapel Hill. Dept. of Botany.

P. H. Campbell.

In: North Carolina University Sea Grant Publication UNC-SG-73-07, p 1-359, March 1973. 24 fig, 33 plates, 11 tab, 279 ref.

Descriptors: *Phytoplankton, *Systematics, *Estuaries, *North Carolina, Classification, Aquatic life, Diatoms, Environmental effects, Sampling, Water temperature, Salinity, Dissolved oxygen, Light penetration, Hydrogen ion -concentration, Nutrients.
Identifiers: *Phytoplankton, *Taxonomy, *Gales Creek (N.C.).

The phytoplankton of Gales Creek, a small shallow coastal plain estuary near Morehead City, N. C., was studied for over a year. Special emphasis was placed on determining the species composition and distribution patterns of the phytoplankton and in measuring environmental factors which may influence the presence and distribution of these species. A total of 187 diatom taxa were identified. Diatoms exhibited a classic bimodal pattern of seasonal abundance with maxima in spring and autumn. A total of 152 species of phytoplankton in 49 genera and 9 classes of algae are described and figured, including 32 species, 4 varieties and 6 combinations new to science. Phytoplankton dominated the phytoplankton throughout most of the year. The mean yearly standing crop for phytoplankton was only 500,000 cells/liter. Low densities are attributed to low nitrate concentrations and high flushing rate of the estuary. Phytoplankton seasonal distribution was bimodal with moderate densities in spring and maximum cell concentrations in late summer. A majority of the dominant phytoplankton were eurythermal and euryhaline species. (See also W74-00589) (Woodard-USGS)
W74-00590

PHYTOPLANKTON POPULATIONS IN BRACKISH WATER PONDS, A REVISED RE-

PORT—PART II OF STUDIES ON BRACKISH WATER PHYTOPLANKTON,

North Carolina Univ., Chapel Hill. Dept. of Botany.

P. H. Campbell.

In: North Carolina University Sea Grant Publication UNC-SG-73-07, p 361-406, March 1973. 4 fig, 3 plate, 3 tab, 39 ref.

Descriptors: *Water pollution effects, *Brackish water, *Ponds, *Sewage effluents, *Aquatic life, Environmental effects, Ecosystems, Ecology, Fish, Phytoplankton, Salinity, Systematics, Classification, Growth rates.
Identifiers: *Taxonomy.

Polluted brackish ponds were found to support a high level of primary productivity with sewage plant effluent, but whether this productivity can be converted to a dependable harvest remains to be seen. So far, the production of blue crabs in the ponds has been too low for commercial interest, the palaeomonetes shrimp that grew well are not valued as human food, the edible fish did not grow. The system was strongly taxed by very dense phytoplankton concentrations, primarily of a single species, so perhaps better results could be achieved by holding these densities below the 100,000 cells/ml concentrations where species diversity can still be maintained, possibly by increasing the flushing rate of the ponds from their normal one to two times per month. The ponds support a wide diversity of species representing 10 classes of phytoplankton. The 155 taxa of phytoplankton observed in the 16-month study included 97 diatoms, 16 dinoflagellates, 9 cryptomonads, 8 prasinophytes, 6 xanthophytes, 5 chrysophytes, 5 green algae, 4 euglenoids, 3 haptophytes, and 2 blue-green algae. A number of these organisms did not readily fit existing descriptions and are probably new taxa merely awaiting further observation and study. (See also W74-00589) (Woodard-USGS)
W74-00591

BIMAGNIFICATION OF P,P'-DDT AND METHOXYCHLOR BY BACTERIA,

Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.

For primary bibliographic entry see Field 05B.

W74-00615

SURVIVAL OF VIBRIO PARAHAEMOLYTICUS IN OYSTER SHELLSTOCK AT TWO DIFFERENT STORAGE TEMPERATURES,

Maryland Dept. of Health and Mental Hygiene, Baltimore. Labs. and Research Administration.

W. G. Johnson, Jr., A. C. Salinger, and W. C. King.

Applied Microbiology, Vol 26, No 1, p 122-123, July 1973. 2 tab, 8 ref.

Descriptors: *Pathogenic bacteria, *Enteric bacteria, *Storage, *Temperature, Marine bacteria, Isolation, Oysters, Pollutant identification, Anaerobic bacteria, Shellfish, Virginia, Maryland. Identifiers: Survival, *Oyster shellstock, *Vibrio paraheamolyticus, Culture media, Fisher Bay, Chincoteague Bay.

The presence and survival of *V. paraheamolyticus* were determined in oyster shellstock taken from an outlet, Fishing Bay, of the Chesapeake Bay and transported to a floating area in the Chincoteague Bay, an inlet of the Atlantic Ocean. Some of the samples collected at intervals from Chincoteague Bay were examined immediately while others were stored at 35°C and 4°C. *V. paraheamolyticus* was isolated by culturing equal volumes of oyster meats and liquor from 12 organisms in Trypticase soy broth. After 24 h incubation at 35°C samples from each dilution were streaked on thiosulfate-citrate-bile salt-sucrose agar. These were then incubated at 35°C for 24 h. *Vibrio paraheamolyticus* was found to be present, to survive storage for at

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

least 3 weeks at 4°C, and to multiply after being held for 2 to 3 days at 35°C. (Holoman-Battelle)
W74-00616

SOME OBSERVATIONS ON THE INCORPORATION OF NOVORIOTICIN INTO HEKTOEN ENTERIC AGAR FOR IMPROVED SALMONELLA ISOLATION,
Campbell Inst. for Food Research, Camden, N.J.
For primary bibliographic entry see Field 05A.
W74-00617

IDENTIFICATION AND CHARACTERIZATION OF THE MICROFLORA AND SPOILAGE BACTERIA IN FRESHWATER CRAYFISH PROCAMBARUS CLARKII (GIRAD),
Louisiana State Univ., Baton Rouge. Dept. of Food Science.
For primary bibliographic entry see Field 05A.
W74-00620

CONDITION OF COLIFORM ORGANISMS INFLUENCING RECOVERY OF SUBCULTURES ON SELECTIVE MEDIA,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05B.
W74-00621

EFFECTS OF CALCIUM AND MAGNESIUM IONS AND HOST VIABILITY ON GROWTH OF BDULLOVIBRIOS,
California Univ., Davis. Dept. of Bacteriology.
J. C.-C. Huang and M. P. Starr.
Antonie van Leeuwenhoek, Vol 39, No 1, p 151-167, 1973. 5 tab, 31 ref.

Descriptors: *Cultures, *Calcium, *Magnesium, *Growth rates, *Hosts, Bioassay, Nutrients, Viability, Parasitism.
Identifiers: **Bdellovibrio*, Culture media, Amino sugars, Sugars, Bacterial physiology, *Spirillum serpens*.

Bdellovibrio spp strains 6-5-S, 100, 109 and A3.12 multiply in the presence of viable but non-proliferating or heat-killed cells of *Spirillum serpens* strain VHL suspended in buffers supplemented with Ca (2 plus) and/or Mg (2 plus). Ca (2 plus) and Mg (2 plus) independently stimulated the growth of *Bdellovibrios*: additive effects were noted. Multiplication of *Bdellovibrio* in the presence of Ca (2 plus) and Mg (2 plus) was associated with the release into the culture supernatant solution of UV-absorbing materials and of amino sugars. The growth rate of *Bdellovibrio* strain 6-5-S in suspensions of heat-killed host cells was lower than in living but non-proliferating host cells. All *Bdellovibrio* spp strains tested required added Ca (2 plus) for growth in cell suspensions of homologous or heterologous host bacteria which have been grown in minimal medium. *Bdellovibrio* sp strain 109 (Jerusalem) was capable of growing in the presence of the low level of Ca (2 plus) bound in situ to the cells of its host, *E. coli* B, when the host cells had been cultivated in a complex medium but not when the host cells had been grown in a Ca (2 plus)-depleted minimal medium. Addition of ethylenediaminetetraacetic acid prevented *Bdellovibrio* growth, which was restored by addition of Ca (2 plus) and Mg (2 plus). The cations Ca (2 plus) and Mg (2 plus) are essential for activity of bacteriolysin and other enzymes and they might also directly affect *Bdellovibrio* growth rather than only indirectly by affecting attachment to the host cell, maintaining integrity of the host spheroplasts, and increasing the burst size. (Little-Battelle)
W74-00625

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-

WATER ALGAE: AN EXPERIMENTAL STUDY. II. THE ROLE OF PH AND THE CARBON DIOXIDE-BICARBONATE SYSTEM,
Michigan State Univ., East Lansing. Dept. of Botany.

B. Moss.
Journal of Ecology, Vol 61, No 1, p 157-177, March 1973. 7 fig, 5 tab, 50 ref.

Descriptors: *Environmental effects, *Aquatic algae, *Ecological distribution, *Laboratory tests, *Growth rates, *Water properties, Carbon dioxide, Bicarbonates, Hydrogen ion concentration, Plant growth, Trophic level, Iron, Trace elements, Water quality, Cyanophyta, Chlorophyta, Euglenophyta, Chrysophyta, Pyrophyta, Diatoms, Dinoflagellates, Incubation, Cultures, Oligotrophy, Eutrophication, Biomass, Carboates, Sodium chloride, Water pollution effects, Chelation, Hardness (Water), Plant physiology, Bioassay, Limiting factors.

Identifiers: Data interpretation, EDTA, Algal physiology, *Chlamydomonas reinhardtii*, *Euglena gracilis*, *Trachelomonas grandis*, Flagellates, Desmids, Cryptomonads, Sodium bicarbonate, *Gloeo capsula*, *Gloeo trichia*, *Tolyphothrix distorta*, *Cryptomonas ovata*, *Eutonia*, *Nitzschia palea*, *Synura petterseii*, *Peridinium cinctum*, *Cladophora acerosum*, *Cosmarium botrytis*, *Desmidium swartzii*, *Eudorina californica*, *Gonatozygon monotaenium*, *Haematococcus droebakensis*, *Mesotaenium kramstai*, *Micrasterias* spp, *Oedogonium cardiacum*, *Pandorina morum*, *Pediastrum duplex*, Ammonium, *Gloeo capsula*, *Gloeo trichia*, *Tolyphothrix distorta* var. *symploclides*, Culture media, *Euglena gracilis*, *Chlamydomonas reinhardtii*.

Experiments to determine the growth rate of 15 species of algae at temperatures between 4 and 36°C were carried out in constant temperature water baths fitted with heater and refrigeration units. The experimental flasks were shaken at 40 strokes/min on a submerged reciprocating tray. Size of the organisms was measured as cellular organic matter capable of oxidation by hot acid potassium dichromate, using exponential phase, unsynchronized cultures grown at or near the optimum temperature for growth. Vitamin requirements (vitamin B12, biotin, thiamine) WERE STUDIED IN SETS OF VARIOUSLY MODIFIED STANDARD MEDIA. The maximum growth rates of oligotrophic species tended to be smaller than those of eutrophic species. Temperature optima for growth under the conditions used did not differ between the two groups. Possible adaptive advantages of low growth rates in infertile waters are discussed in relation to theoretical generalizations on the maturity of ecosystems. Some members of both groups required vitamin B12 for growth, and most species tested could use either nitrate or ammonium as a nitrogen source. (See also W74-00639) (Holoman-Battelle)

W74-00640

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-WATER ALGAE: AN EXPERIMENTAL STUDY. IV. GROWTH OF TEST SPECIES IN NATURAL LAKE WATERS, AND CONCLUSION,
Michigan State Univ., East Lansing. Dept. of Botany.
B. Moss.

Journal of Ecology, Vol 61, No 1, p 193-211, March 1973. 12 fig, 1 tab, 42 ref.

Descriptors: *Bioassay, *Environmental effects, *Aquatic algae, *Lakes, Limiting factors, *Ecological distribution, *Laboratory tests, Trophic level, Chlorophyta, Nutrient requirements, *Michigan, Hardness (Water), Hydrogen ion concentration, Oligotrophy, Eutrophication, Phosphorus, Scenedesmus, Chlorella, Diatoms, Chrysophyta, Plant physiology, Carbon dioxide, Cultures.

Identifiers: Natural waters, Algal physiology, *Pandorina morum*, *Cosmarium botrytis*, Desmids, *Micrasterias americana*, *Pleurotaenium trabecula*, *Nitzschia palea*, *Achnanthes*, *Fragilaria*, *Bear lake*, *Duck Lake*, *Gull Lake*, *Lawrence Lake*, *Wintergreen Lake*, Culture media.

Growth of two eutrophic species, *Pandorina morum* and *Cosmarium botrytis*, and of two oligotrophic species *Micrasterias americana* and *Pleurotaenium trabecula*, was measured in filtered natural lake waters of varied chemical composition. Such experiments were carried out to test the following assertions: (1) The reduction of the free CO₂ level, brought about by experimental increase in pH, should decrease growth of oligotrophic species in soft waters. The reduction of pH in hard waters should permit increased growth of oligotrophic species. (2) In the presence of adequate phosphate, nitrate and other potentially

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESH-WATER ALGAE: AN EXPERIMENTAL STUDY. III. EFFECTS OF TEMPERATURE, VITAMIN REQUIREMENTS AND INORGANIC NITROGEN COMPOUNDS ON GROWTH,
Michigan State Univ., East Lansing. Dept. of Botany.

B. Moss.
The Journal of Ecology, Vol 61, No 1, p 179-192, March 1973. 6 fig, 3 tab, 48 ref.

Descriptors: *Growth rates, *Environmental effects, *Nutrient requirements, *Water tempera-

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limiting nutrients, eutrophic species should be able to grow in both soft and hard waters. In all waters but those of a heavily fertilized lake, addition of a mixture of potentially limiting nutrients gave much greater growth than that obtained in controls. The oligotrophic species grew better in hard waters if the pH was reduced, and less well in soft waters when the pH was increased. The results are in accord with predictions made from laboratory experiments with defined culture media. Bio-assays, employing the indigenous flora as test organisms, were carried out for limiting nutrients in the waters used. In soft waters both nitrogen and phosphorus were found to be limiting to algal growth in general, while phosphorus alone appeared limiting in two hard-water lakes. The interpretation of bio-assays is discussed. A general summary of the conclusions of Parts I-IV is presented as an overall hypothesis. (See also W74-00639) (Holoman-Battelle)
W74-00641

THE STANDING CROP AND PRIMARY PRODUCTIVITY OF THE PHYTOPLANKTON OF ABBOT'S POND, NORTH SOMERSET,
Bristol Univ. (England). Dept. of Botany.
M. Hickman.
Journal of Ecology, Vol 61, No 1, p 269-287,
March 1973. 10 fig, 3 tab, 45 ref.

Descriptors: *Primary productivity, *Standing crops, *Biomass, *Phytoplankton, *Ecological distribution, Limiting factors, Aquatic algae, On-site tests, Chrysophyta, Dominant organisms, Pyrrophyta, Chlorophyta, Depth, Plant populations, Light intensity, Photosynthesis, Radioactivity techniques, On-site data collections, Diatoms, Water quality, Water properties, Seasonal, Temporal distribution, Spatial distribution.
Identifiers: *Abbot's Pond (U.K.), Photosynthetic index, Cryptomonads, Chlorophyll a, Enumeration, Cell volume, C-14, Asterionella formosa, Peridium aciculiferum, Woloszynskia, Scenedesmus granulatus, Pandorina morum, Chlamydomonas monadina, Synura, Chrysococcus diaphanus, Vertical distribution, Synechococcus acus var. angustissima, Diatoma elongatum, Trachelomonas volvocina, Stephanodiscus rotula, Rhodomonas minuta var. nannoplanktica, Cryptomonas erosa.

The standing crops and primary productivity of the phytoplankton of a small, eutrophic body of water, Abbot's Pond, have been studied over a 24-month period. Water samples collected with a closing water sampler at 0.5-m intervals were kept in subdued light for standing crop and primary productivity measurements. Standing crops were determined by cell counts, and by measuring cell volumes, and the chlorophyll a content of the phytoplankton. Primary productivity was measured using the C-14 technique. The total alkalinity and pH of each sample were measured so that the total dissolved carbon dioxide (mg/l) in each water sample could be calculated. In general, both standing crops and primary productivity were large, and decreased with increasing depth and hence decreasing light intensity. However, exceptions to this general trend did occur. Results are considered with reference to the species of phytoplankters. Relationships of different measures of standing crop are discussed. Also, relationships between productivity and chlorophyll a content, and between productivity and light intensity, were investigated, as was the photosynthetic index. The mean yearly primary productivity of the phytoplankton was approximately twelve times that of the epipelagic on an areal basis. The most important factor limiting productivity appeared to be light. (Holoman-Battelle)
W74-00651

ELECTRON MICROSCOPE AND PHYSICAL CHEMICAL CHARACTERIZATION OF C-

-PHYOCYANIN FROM FRESH EXTRACTS OF TWO BLUE-GREEN ALGAE,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
For primary bibliographic entry see Field 05A.
W74-00652

MICROBIAL FORMATION OF NITROSAMINES IN VITRO,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 05B.
W74-00654

NEGATIVE CHEMOTAXIS OF MARINE BACTERIA TO TOXIC CHEMICALS,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
L. Y. Young, and R. Mitchell.
Applied Microbiology, Vol 25, No 6, p 972-975, June 1973. 2 fig, 1 tab, 10 ref.

Descriptors: *Marine bacteria, *Organic compounds, *Inorganic compounds, Heavy metals, Toxicity, Chemicals, Viability, Copper sulfate.
Identifiers: *Chemotaxis, *Heterotrophic bacteria, *Pseudomonads, Hydrocarbons, Chloroform, Ethanol, Toluene, Organic solvents, Benzene, Lead nitrate.

The pattern and extent of negative chemotactic behavior are described for four motile marine bacteria. Sublethal concentrations of toxic organic (0.001-5 percent, wt/vol) and inorganic (0.0001-0.5 percent, wt/vol) compounds were used as stimuli. The viability of the organisms over the range of concentrations used was determined by incubating a known concentrations of cells in each concentration of chemical for 10 min. Numbers were determined by serial dilution in artificial seawater and plating on seawater-nutrient agar. The positive chemotactic responses were reversed by the addition of the sublethal concentrations of the toxic chemical. The negative chemotactic effect was observed with a wide range of toxicants including heavy metals and hydrocarbons. This phenomenon may be utilized to develop new approaches for control of marine fouling. (Holoman-Battelle)
W74-00658

RESPONSES OF A MIXED PHYTOPLANKTON POPULATION TO NUTRIENT ENRICHMENTS OF AMMONIA AND PHOSPHATE, AND SOME ASSOCIATED ECOLOGICAL IMPLICATIONS,
Freshwater Biological Association, Ambleside (England).
A. B. Viner.

Proceedings of the Royal Society of London, Series B, Vol 183, No 1073, p 351-370, July 3, 1973. 7 fig, 3 tab, 37 ref.

Descriptors: *Cultures, Limiting factors, Respiration, *Photosynthesis, *Phytoplankton, *Absorption, Nitrogen, Phosphorus, Dissolved oxygen, Carbon, Carbon dioxide, Bioassay, Laboratory studies, On-site tests, Nutrients, Phosphates, Ammonia, Light intensity, Algae, Diatoms, Water quality, Population, Ecology.
Identifiers: *Enrichment, *Microcystis aeruginosa*, Chlorophyll a, *Nitzschia fonticola*, *Microcystis flos-aquae*, Lake George, Uganda.

To test the hypothesis that nitrogen and phosphorus were major elements limiting phytoplankton growth in Lake George (W. Uganda), experiments were carried out in which ammonia-nitrogen and phosphate-phosphorus were added to freshly sampled mixed populations of phytoplankton. Natural, mixed plankton were cultured in conical flasks immersed in a water bath and illuminated. Experiments were also conducted in which culture bottles were suspended in the lake. Chlorophyll a was determined by methanol

extraction, carbon by conversion to CO₂, and oxygen by the Winkler procedure. Nitrogen starvation was inferred from the very high uptake rate of ammonia in the light and also substantial uptake in the dark, implying a reserve of photosynthate unused for growth purposes. Phosphate enhanced these responses. The addition of both ammonia and phosphate increased the respiratory rate of the algae, but not the photosynthetic rate until after a period when growth of the phytoplankton must have occurred. There is some evidence that such growth did not occur until after the second day of experimentation and the responses before this time reflected the demands of the algae in the lake at the time of sampling. Repeated experiments over a period of 6 months showed similar patterns of response to enrichment although quantitatively they were different. A number of ecological implications of the results are discussed. (Holoman-Battelle)
W74-00665

DEVELOPMENT OF A SELECTIVE ALGAE-CIDE TO CONTROL NUISANCE ALgal GROWTH,
Dow Chemical Co., Freeport, Tex. Texas Div.
For primary bibliographic entry see Field 05G.
W74-00702

ALGAE ABSTRACTS, A GUIDE TO THE LITERATURE, VOLUME 1 TO 1969; VOLUME 2, 1970-1972.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

IFI/Plenum: New York 1973. Vol I, 585 p; Vol II, 693 p. \$65.00 per set.

Descriptors: *Bibliographies, *Algae, *Abstracts, *Eutrophication, Algal control, Analytical techniques, Bioassay, Biodegradation, Cyanophyta, Nutrients, Lakes, Nitrogen, Phosphorus, Phytoplankton, Sewage, Water pollution effects, Waste water treatment, Documentation, Indexing.

This is the first in a series of bibliographies on water resources and pollution published by IFI/Plenum Data Corporation in cooperation with the Water Resources Scientific Information Center (WRSIC). It is produced wholly from the information base comprising material abstracted and indexed for Selected Water Resources Abstracts. The bibliography is divided into volumes according to the publication dates of the source documents. Volume 1 contains 569 abstracts covering publication dates up to and including 1969; Volume 2 contains 730 abstracts covering the years 1970 to 1972. The material included in this bibliography represents computer selections based on the presence of a form of the word 'alga' somewhere in the referenced citation. Substantively, the material typifies WRSIC's 'centers of competence' approach to information support of the Office of Water Resources Research (OWRR) or the Department of the Interior. Most of the references in this bibliography are the work of the center of competence on eutrophication at the University of Wisconsin.
W74-00704

EFFECTS OF ELEMENTAL PHOSPHORUS ON MARINE LIFE.
Fisheries Research Board of Canada, Halifax (Nova Scotia).

Circular No. 2, November 1972. 313 p. 108 fig, 52 tab, 205 ref, 1 append.

Descriptors: *Phosphorus, *Marine animals, *Marine plants, *Canada, *Water pollution effects, Water pollution control, Mortality, Marine fish, Fisheries, Herrings, Estuaries, Invertebrates,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

Toxicity, Salmonids, Lobsters, Oxidation, Water pollution sources, Bottom sediments, Benthos, Animal pathology, Gas chromatography, Fluorides, Soils, Phosphorus compounds, Analytical techniques, Tidal effects, Tracers, Measurement, Bioassay, Dredging, Sculpins, Crabs, Mussels, Monitoring.

Identifiers: *Placentia Bay (Newfoundland), Elemental phosphorus, 'Red' herring, Cod.

Dead and dying fish were found in the winter and spring of 1969 in Placentia Bay, Newfoundland, coinciding with the opening of a phosphorus plant. While circumstantial evidence implicated plant effluents, direct evidence was lacking. A major coordinated investigation indicated that phosphorus quantities in the effluent were greater than required to kill fish, the most susceptible of which were herring, exhibiting 'red' symptoms. Phosphorus accumulation in the bottom sediments near the effluent outfall was also toxic to fish. The behavior of elemental phosphorus as a pollutant was studied in its decomposition in water, the capacity of the estuary to accept pollutants, and the assimilation of elemental phosphorus by marine organisms assessed. Histology and hematology of 'red' herring and lobsters were conducted. Methods were developed for direct determination of elemental phosphorus by gas-liquid chromatography and direct determination of fluoride in water. The Electric Reduction Company modified its pollution abatement procedures and was reopened after the investigation. (See W74-00706 thru W74-00712) (Auen-Wisconsin) W74-00705

COEXISTENCE OF A FISHERY AND A MAJOR INDUSTRY IN PLACENTIA BAY,

Fisheries Research Board of Canada, Halifax (Nova Scotia).

D. R. Idler.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 1-6. 8 fig.

Descriptors: *Water pollution effects, *Fisheries, *Industries, *Marine fish, *Phosphorus, *Canada, Ammonia, Fluorides, Fishkill, Magnesium compounds, Toxicity, Herrings, Lobsters, Sea water, Trout, Salmonids, Hydrogen ion concentration, Sulfur compounds, Bottom sediments, Pollution abatement, Dredging, Waste water treatment, Social aspects.

Identifiers: *Placentia Bay (Newfoundland), Cod, 'Red' herring, Fluorapatite, Elemental phosphorus.

The Placentia Bay, Newfoundland fishery, principally for herring, cod, and lobsters, showed extensive fish mortalities, coinciding with the opening of a phosphorus plant. Plant effluents included so-called 'phossy' water containing phosphorus, cyanide and ammonium ion; water from the pelletizing plant contained the majority of the fluoride; and water from the dryers contained sulphur dioxide. The fluosilicic acid emitted required neutralization; this fact coupled with high fluoride content and large volume of the effluent and possibly seawater pump corrosion, resulted in incomplete neutralization. Immobilization of fish by low pH offers one explanation why fish did not avoid exposure to phosphorus. Phosphorus quantities in the effluent were far greater than those required to kill the species. Even if the effluent discharge was halted, the accumulation of phosphorus on the bottom was sufficient to kill fish in that vicinity. Also sulphur dioxide and ammonia in effluent were toxic because of the relatively large quantities present. Bioassays were carried out on bottom sediments, confirming laboratory studies that bottom sediments were extremely toxic to fish. The phosphorus plant was reopened after the toxic substances in its effluent were treated and retained on the premises. (See also W74-00705) (Jones-Wisconsin)

W74-00706

DECOMPOSITION OF PHOSPHORUS IN WATER,

Memorial Univ. of Newfoundland, St. John's. Dept. of Chemistry.

E. Bullock, and M. J. Newlands.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 55-56.

Descriptors: *Degradation (Decomposition), *Phosphorus, *Sea water, *Canada, Anions, Oxidation, Solubility, Analytical techniques, Colloids, Suspension.

Identifiers: Elemental phosphorus, *Placentia Bay (Newfoundland), Long Harbour (Newfoundland).

Investigation of the pollution problem in Long Harbour of Placentia Bay, Newfoundland, called for cooperative research involving many agencies and independent bodies. Studies of fundamental problems, estimation of low concentrations of elemental phosphorus and oxidation of elemental phosphorus in solution or suspension were undertaken. Elemental phosphorus was analyzed by a modification of the method of the Electric Reduction Company of Canada Limited. The best results gave suspensions containing up to 200 ppm elemental phosphorus. The half-life for the oxidation of white phosphorus in suspension shows that it would take several days to reduce the elemental phosphorus concentration of ERCO effluent to a value below tolerance level values for humans. It is likely that the TLV for fish is considerably smaller than for humans since body weight and rate of respiration are both major factors. Moreover, studies have made it clear that very little dilution occurs in Long Harbour. It follows that no elemental phosphorus should be emitted from the ERCO plant. The plant has installed a new treatment plant in order to continue operations. (See also W74-00705) (Jones-Wisconsin) W74-00707

CAPACITY OF AN ESTUARY TO ACCEPT POLLUTANTS,

Bedord Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.

R. W. Trites.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 57-69. 11 fig. 8 ref.

Descriptors: *Estuaries, *Pollutants, *Self-purification, *Measurement, Tidal effects, Model studies, Solubility, Dispersion, Diffusion, Circulation, Bays, Mixing, Winds.

Identifiers: Flushing rates.

Concentration of pollutant at any given point in the environment will depend upon rate and concentration of effluent being discharged, decomposition rate of the pollutant, and dilution rate due to mixing with 'clean' water. Attention is focused on dilution rate. The rate of flushing will depend upon the strength of tidal and non-tidal currents, wind, wave, and swell action, precipitation and fresh water discharge and physical configuration of the area involved. If the response of the water to these forces were understood, the flushing time could be computed in principle and the concentration and distribution of pollutant predicted for any given situation. In practice, a semi-empirical approach must be taken. In many coastal embayments where pollution or potential pollution exists, the circulation and diffusion processes are the result of a number of factors, and frequently no single factor is predominant at all times. Meteorological parameters may frequently be dominant. Experimental tracer techniques, combined with measurements taken over various conditions, appear the most useful approach to the

problem. It is probably wise to consider dilution rates at times to be an order of magnitude less than those measured under field conditions. (See also W74-00705) (Jones-Wisconsin) W74-00708

AN ASSESSMENT OF THE ASSIMILATION OF ELEMENTAL PHOSPHORUS BY NEWFOUNDLAND MARINE ORGANISMS IN THE 1969 POLLUTION PROBLEM AND IN 1970 MONITORING OPERATIONS,

Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.

R. G. Ackman, R. F. Addison, and J. Hingley.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 71-109. 3 fig, 18 tab.

Descriptors: *Phosphorus, *Marine fish, *Water pollution effects, *Analysis, Monitoring, *Canada, Fishkill, Herrings, Mortality, Fish diseases, Sea water, Bioassay, Lobsters, Crabs.

Identifiers: Elemental phosphorus, *Placentia Bay (Newfoundland), Long Harbour (Newfoundland), 'Red' herring, Cod.

Results of analyses on field specimens of fish and other marine organisms from Placentia Bay, Newfoundland, for elemental white (or yellow) phosphorus are reported. The problem was delineated in 1969, and more controlled sampling was done in 1970. Determination of phosphorus was carried out by gas-liquid chromatography. On a wet weight basis one ppb was detected and measured, and, by concentrating the organic solvent by a factor of 10, detection limit was 0.1 ppb or better. Herrings are much more susceptible than other fish to hemorrhagic effects from elemental phosphorus poisoning. The conclusion reached in late 1969 concerning herring was that fish accumulating 500-1000 ppb of elemental phosphorus in the flesh died rapidly at or near the scene of exposure. Exposure leading to lesser accumulations, 50-100 ppb, may have permitted herring to travel considerable distances before death. The year 1970 opened with great concern about 'red' herring from the commercial fishery in Southern Harbour. It is not an unreasonable supposition that more than 40 ppb elemental phosphorus in herring flesh is lethal within one or two days. Studies were also made on cod, sculpin, flatfish, flounder, crab, lobster, salmon, smelt, and miscellaneous fish. (See also W74-00705) (Jones-Wisconsin) W74-00709

OBSERVATIONS ON MORTALITIES OF BENTHIC ORGANISMS AFTER CONTAMINATION OF THE BOTTOM OF LONG HARBOUR, PLACENTIA BAY, NEWFOUNDLAND WITH ELEMENTAL PHOSPHORUS,

Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.

D. L. Peier.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 181-186. 2 fig, 3 tab, 4 ref.

Descriptors: *Phosphorus, *Mortality, *Benthic fauna, *Bottom sediments, *Water pollution effects, *Canada, Mussels, Fishkills, Toxicity, Amphipoda, Particle size, Analytical techniques.

Identifiers: Elemental phosphorus, *Long Harbour (Newfoundland), *Placentia Bay (Newfoundland), Sand dollars, Sea anemone.

Following opening of an elemental phosphorus producing plant in Long Harbour, Placentia Bay, Newfoundland, divers observed dead fish upon the bottom throughout Long Harbour. Mortalities were confined to water less than 18 m in depth. Sediments were investigated for possible toxic

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materials and mortalities of benthic invertebrates. Where depth permitted, sediment samples were taken by divers inserting a plastic tube. When depths were over 13 m the sediment was cored after being brought up in a bottom grab. Which sediment type or size fractions contained the highest proportion of elemental phosphorus was determined. Because of color, consistency, and melting point, it was concluded the material found was elemental (yellow) phosphorus. Apparently a large amount of the phosphorus in the Long Harbour sediment was in lumps of pure phosphorus less than 1/2 mm in diameter. There was some visual evidence of selective mortality among benthos. Live mussels were found within 300 m of the effluent pipe while scallops within this area were all dead. With some exceptions, the benthic faunal community appeared normal in terms of mean wet weight numbers, and species composition compared to similar depth and substrate in a relatively non-polluted area. (See also W74-00705) (Jones-Wisconsin)
W74-00710

SYMPTOMS OF 'RED' HERRING IN RELATION TO THE MASS MORTALITIES IN PLACENTIA BAY, FEBRUARY-APRIL 1969,
Fisheries Research Board of Canada, St. John's (Newfoundland). Biological Station.
J. H. C. Pippy, V. M. Hodder, and L. S. Parsons.
In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 187-191. 1 fig, 9 ref.

Descriptors: *Herrings, *Phosphorus, *Mortality, *Toxicity, Industrial plants, *Canada, Pathology, Fishkill, Water pollution effects, Fish diseases.
Identifiers: *'Red' herring symptoms, *Placentia Bay (Newfoundland).

During February to April 1969 mass mortalities of herring occurred in Placentia Bay, Newfoundland. Dead and drying fish exhibited a bright red skin coloration. To determine the cause, autopsies were performed on both 'red' and normal herring obtained during the field investigations. Many herring were examined grossly for evidence of abnormal quantities of parasites and of abnormal changes in appearance of external and internal organs and tissues. Comparison of normal blood with that of 'red' herring revealed extensive destruction of erythrocytes. Fungi were ruled out as possible cause of the mortalities. Samples from extensive phytoplankton blooms in the northern half of Placentia Bay during mid-and late April did not reveal any form of toxin-producing algae, nor did high concentrations of the phytoplankton have any effect on sticklebacks held in aquaria. It was concluded that the mass mortalities of herring were caused by the presence of elemental phosphorus in the bay. Those which died in the contaminated area very likely represent acute cases of hemolysis, whereas those which survived and exhibited green intestines when caught some time later probably represent chronic cases. (See also W74-00705) (Jones-Wisconsin)
W74-00711

ANALYSIS OF ELEMENTAL PHOSPHORUS AND SOME OF ITS COMPOUNDS BY GAS CHROMATOGRAPHY,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
R. F. Addison.

In: 'Effects of Elemental Phosphorus on Marine Life,' Fisheries Research Board of Canada, Research and Development, Halifax, Nova Scotia, Circular No. 2, November 1972, p 233-237. 2 fig, 19 ref.

Descriptors: *Analytical techniques, *Phosphorus, *Phosphorus compounds, *Gas chromatography, Sediments, Absorption, Plant

tissues, Toxicity, Marine plants, Marine animals, Stability, *Canada, Bioassay, Pollutant identification.
Identifiers: Elemental phosphorus, *Placentia Bay (Newfoundland).

Results of some short term toxicological and chemical studies initiated by extensive herring mortality in Placentia Bay, Newfoundland, are reviewed. Direct determination of elemental (yellow) phosphorus by gas-liquid chromatography is described. The method allows the specific detection and estimation of elemental phosphorus in the subnanogram range in samples, including sediments, water, and plant or animal tissues. The approach was to partially isolate elemental phosphorus by extraction with a suitable organic solvent such as benzene or isoctane. An extract aliquot was then subjected to gas-liquid chromatography on a non-polar column. Elemental phosphorus was eluted within a few minutes of injection and measured in a P-sensitive and P-specific detector. Gas-liquid chromatographical methods for detection of hypophosphate, phosphate, and phosphite, in the nanogram range, as their trimethylsilyl derivatives, are discussed. The products of elemental oxidation in water were studied using these procedures. Toxicity of elemental phosphorus to marine organisms and its uptake into plant and animal tissues is reviewed. Something of how elemental phosphorus behaves in aqueous and in biological systems is now known and its toxicity to marine organisms well defined. However, the major toxicological question of how phosphorus kills is still unsolved. (See also W74-00705) (Jones-Wisconsin)
W74-00712

NITROGEN FIXATION BY ANABAENA CYLINDRICA. I. LOCALIZATION OF NITROGEN FIXATION IN THE HETEROCYSTS,
California Univ., San Diego, La Jolla. Dept. of Chemistry.

N. M. Weare, and J. R. Benemann.
Archiv für Mikrobiologie, Vol 90, No 4, p 323-332, 1973. 4 fig, 39 ref.

Descriptors: *Nitrogen fixation, *Anabaena, *Cytological studies, Oxygen, Light, Carbon dioxide, Inhibition, Cyanophyta.

Identifiers: *Anabaena cylindrica, *Heterocysts, Dark.

The experiments described indicate that heterocysts are the main, probably exclusive, sites of nitrogen fixation in both air- and N2-grown cultures of *Anabaena cylindrica*. The blending experiments indicate that filament breakage occurs preferentially at the junction between vegetative cells and heterocysts, and that breaking this connection results in a loss of nitrogenase activity. Correlation of filament breakage at the heterocysts with loss of nitrogen fixation activity was found with both air- and N2-grown cultures and under aerobic and anaerobic blending and assay conditions. The kinetics of the loss of nitrogen fixation activity during aerobic dark incubation and its recovery after transfer to the light can be explained in terms movement of reductant- and ATP-generating supplies from the vegetative cells to heterocysts. The data support the view that in the dark aerobic assays ATP was the limiting substrate of nitrogenase, whereas after three hours of dark aerobic incubation the reductant supply became limiting. In a hypothetical model shown vegetative cells provide reduced carbon compounds to the heterocysts which utilize them to generate NADPH which is then able to reduce nitrogenase through ferredoxin. (Jones-Wisconsin)
W74-00713

NUTRIENT LOADING FROM A SEPARATE STORM SEWER IN MADISON, WISCONSIN,
Wisconsin Univ., Madison. Water Chemistry Program.

J. W. Kluesener, and G. F. Lee.

International Biological Program, Deciduous Forest Biome, Lake Wingra Study, (Mimeo) (1972), 30 p. 16 fig, 3 tab, 14 ref. EPA Project 16010 EHR.

Descriptors: *Eutrophication, *Water pollution sources, *Storm drains, *Urban runoff, *Wisconsin, Storm water, Nutrients, Rainfall, Watersheds (Basins), Nitrogen, Phosphorus, Suspended solids, Ammonia, Nitrates, Leaching, Vegetation, Fertilizers, Roads, Litter, Fallout, Organic matter.
Identifiers: *Nutrient sources, Madison (Wis.), *Lake Wingra (Wis.).

Potential importance of nutrient loading from separate storm sewers prompted study of relationship between rainfall and runoff into Lake Wingra, Wisconsin. Nutrient concentration variability throughout a storm and for different seasons, nutrient loading annually, potential nutrient sources, sampling requirements to quantify loadings, and significance relative to other nutrient sources were evaluated. Approximately 15% of rainfall appears as surface runoff. Nutrient and suspended solids concentrations were usually greatest during early stages of runoff events, decreasing with time. Phosphorus concentrations were greatest in spring and fall; nitrogen concentrations were greatest in spring. Rainfall appeared the major source of inorganic-N. Phosphorus generally resulted from accumulated litter and possibly automotive exhaust. Barring availability of suitable flow proportioned sampler, the next most appropriate sampling procedure would be to characterize the particular basin by collecting flow and chemical data over fairly short time intervals for several storms. Samples should continue to be collected over the same short time intervals but flow data and historical relationship between flow and concentration should be used judiciously to select an appropriate number of samples for chemical analyses. Approximately 80% of the total phosphorus and 35-40% of the total nitrogen influent to Lake Wingra arises from urban runoff. (Jones-Wisconsin)
W74-00716

GLUTAMINE SYNTHETASE OF THE NITROGEN-FIXING ALGA ANABAENA CYLINDRICA,

Dundee Univ. (Scotland). Dept. of Biological Sciences.

M. W. N. Dharmawardene, A. Haystead, and W. D. P. Stewart.
Archiv für Mikrobiologie, Vol 90, No 4, p 281-295, 1973. 11 fig, 9 tab, 37 ref.

Descriptors: *Cytological studies, *Enzymes, *Nitrogen fixation, *Anabaena, Mode of action, *Cyanophyta, Metabolism.

Identifiers: *Glutamine synthetase, *Anabaena cylindrica, Biosynthesis.

Glutamine synthetase characteristics in *Anabaena cylindrica* were determined to demonstrate whether it possesses features of bacterial glutamine synthetase making it most efficient as an assimilatory mechanism under low ammonia concentrations and whether in blue-green algae it is subject to the rigorous control mechanisms demonstrated in some other systems. Presence of such a regulatory system could imply a central role for this molecule in nitrogen metabolism of the group. High levels of glutamine synthetase are present in aerobically grown N2-fixing cultures. The enzyme is soluble, has a pH optimum of 6.5-7.5 and a temperature optimum at 30-40°C. Partially purified preparations are stable in air at 5°C for at least three days. Enzyme activity is regulated at several levels: possibly by repression and derepression of the enzyme in response to ammonia level; by variation in the manganese ions to ATP ratio with optimum activity at a 1:1 ratio; and by feedback inhibition, possibly cumulative. Evidence suggests absence of a covalent enzyme modification of the type found in *E. coli*. Its levels are almost twice as high on a protein basis in the

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heterocysts as in the vegetative cells. (Jones-Wisconsin)
W74-00717

DETERGENT PHOSPHATE AND EUTROPHICATION IN AUSTRALIA,
J. M. Hartwell.
Report March 1973. 23 p. 96 ref.

Descriptors: *Detergents, *Phosphates, *Eutrophication, *Australia, Waste water treatment, Europe, Limiting factors, Sea water, Nitritotriacetic acid, Canada, United States, Great Lakes, Public health, Carbon, Phosphorus, Nitrogen.

Identifiers: Sweden, Germany, Switzerland, United Kingdom.

Water pollution problems in Australia are compared with those in the United States, Canada, Sweden, Germany, Switzerland, and United Kingdom. Australia, even though an industrial nation and not abundantly supplied with water, has few eutrophication problems. Although there are shortcomings in sewerage facilities, the other contributing factors, large inland lakes close to urban and industrial centers, are absent. Some controversy remains regarding the relative importance of the various nutrient elements in limiting algal growth. The idea of a single element limiting algal growth in all waters under all conditions is no longer acceptable. In waters of low primary productivity, many elements, frequently phosphorus may be limiting, but in heavily polluted, eutrophic waters phosphorus is always available in excess, and organic carbon and nitrogen are most often limiting. Arguments regarding the usefulness of banning phosphates from detergents have been largely superseded now that it is known that simple chemical precipitation during primary sewage treatment removes far more phosphate and at lower cost than any restrictions on detergent formulations. The suggestion is made that the study of cultural eutrophication in Australia should be the work of a permanent government committee under the Federal Department for the Environment and Conservation. (Jones-Wisconsin)

W74-00718

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,
Utah Water Research Lab., Logan.

W. J. Grenney, D. A. Bella, and H. C. Curl, Jr.
Biotechnology and Bioengineering, Vol 15, No 2, p 331-358, 1973. 9 fig, 2 tab, 34 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Nitrates, *Absorption, Cytological studies, Nitrogen, Growth rates, Plant physiology, Kinetics, Cultures.

Identifiers: *Intracellular nitrogen storage, *Luxury uptake, Batch cultures, Chemostat cultures.

A three-compartment mathematical model is presented which represents a phytoplankton population having the capability to store nitrogen in a nitrate-limiting environment. Growth rates are represented by saturation kinetics based on concentrations in intracellular nutrient pools. The model distinguishes three forms of intracellular nitrogen to provide a conceptually realistic means of describing nutrient flow through a biological system and can be used as part of a larger model in investigating mechanisms associated with nutrient limitation and recycling in natural environments to demonstrate the changes which may occur in the nitrogenous constituents of a phytoplankton population with time and environmental conditions. It can quantitatively represent phytoplankton growth dynamics observed in chemostat experiments. It also has been shown to, at least qualitatively, represent the temporal variations in intracellular nitrogen composition of phytoplankton popula-

tions in chemostat and batch experiments. Some problems encountered in estimating parameters and applying a one-compartment Monod model can be explained by the intracellular storage phenomenon. (Jones-Wisconsin)

W74-00720

RESPONSE OF AQUATIC LIFE TO SALINITY, TEMPERATURE, DISSOLVED OXYGEN, AND WATER FLOW,
California Univ., Davis. Dept. of Water Science and Engineering.

A. W. Knight, and R. W. Brocksen.
In: University of California-Davis Water Resources Center Annual Report No 25, ; 15-25, 1972. 3 fig, 2 tab.

Descriptors: *Fish food organisms, *California, *Opossum shrimp, *Striped bass, Salinity, Temperature, Dissolved oxygen, Flow, Bioassay, Estuaries, Respiration, Vitamins, Juvenile fish, Growth rates, Metabolism, Detritus, Diatoms, Fish diets, Fish physiology.

Identifiers: *Sacramento-San Joaquin Delta estuary.

Bioassay techniques were conducted to determine the conditions of temperature and salinity appropriate for the survival of the opossum shrimp (*Neomysis awatschensis*), an important food source for young striped bass. Since conditions of the Sacramento-San Joaquin Delta estuary are changing and the water may become saline with future diversions it is important to ascertain the response of *Neomysis* to increased salinity. This study used variations in respiration as a salinity response measure. The bioassay procedure was based on the quanlal response in a series of salinity concentrations along a gradient of temperatures. The opossum shrimp resides in the Delta at salinities ranging from freshwater to 30‰ seawater. Changes in oxygen consumption were recorded over a salinity range of 5 to 70‰ seawater and in temperatures ranging from 6 to 21°C. The respiratory metabolism of juvenile striped bass (*Morone saxatilis*) was measured at five water temperatures; 16°C appears to be the thermal optimum in terms of energetic costs of metabolism. The hemoglobin content of the blood and the quantity of fat stored in the liver were studied as an index to some physiological parameters in analyzing the effects of temperature, salinity and chemical toxicants on the striped bass. (See also W74-14370) (Auen-Wisconsin)

W74-00721

ON THE EFFECT OF POLLUTION ON SURFACE WATERS,

J. Turoboyski.
Gospodarka Wodna, Vol 30, No 1-2, p 129-138, 1970. 13 ref.

Descriptors: Surface waters, *Sewage treatment, *Water pollution effects, *Salinity, Sulfates, Eutrophication, Nitrates, Phenols, Toxins, *Heavy metals, Salts, Chlorides, Chromium, Lead, Industrial wastes, *Thermal pollution, Trophic level, Primary productivity, Copper.

Identifiers: *Poland (Vistula River).

Present treatment of municipal and industrial sewage, in spite of removing the most dangerous pollutants, proves insufficient in certain cases, causing mineralization of Polish rivers. Basic pollution aspects are salinity, toxicity, and warming of water. Pollution from salts not constituting algal food, sensu stricto, from both municipal and industrial sewage and ground waters from mines is well known. Since sewage purification from excessive salinity by physical and chemical methods is expensive and not yet feasible on a large scale, salinity will apparently increase with industrial development and growing river pollution. Methods exist for removal of salts (with wide ranging toxicities) caused by heavy metals in sewage treatment

plants but the process is not adequately carried out. Certain quantities are discharged into rivers and they are not subject to self-purification processes. Artificial heating of water reservoirs, caused by cooling water discharges from power plants and steel mill wastes, and other industries, increased within the last few years. Heating by even 1 to 2°C above normal, on a permanent basis, may induce certain biological changes. (Jones-Wisconsin)

W74-00722

THE 'PALMELLOID' STATE IN A BLUE-GREEN ALGA, ANABAENA SP. I. PRELIMINARY REPORT,
California State Coll., Pa. Dept. of Biological Sciences.

S. C. Bausor, and J. L. Agona.

American Journal of Botany, Vol 60, No 3, p 223-227, 1973. 3 fig, 1 tab, 21 ref.

Descriptors: *Cytological studies, *Plant morphology, *Cyanophyta, *Anabaena, Metabolism, Cultures.

Identifiers: *Palmelloid state.

An *Anabaena*, in the laboratory, had the unusual habit of going into a chroococcoid (palmelloid) phase of development. Observations of its terrarium habitat and its culture are reported in an effort to analyze the meaning of the palmelloid state in general. The terrarium growth was characterized by an exceedingly slimy greenish spread, without symmetrical form. Continued growth of these masses and new conversions of filaments resulted in the amorphous slime covering. Developments of the algae in synthetic media are described. Early growth of newly transferred trichomes of this *Anabaena* strain in cultures showed no evidence of palmelloid development, however, the palmelloid phase reappeared in old cultures. This late appearance of the palmelloid state indicates a changed environment that could involve autoxidation, depletion of carbon dioxide, and change in reaction (pH) of the medium. Since the change involves excessive slime production, whatever the immediate cause, it seems probable that the effect is a change in metabolic gene action related to slime production. It is not formed during rapid growth which seems to favor chain development. The palmelloid state evidently signifies a change in metabolic balance, the unbalanced growth favoring slime production at low metabolic rates. (Jones-Wisconsin)

W74-00723

ALGAL RESPONSE TO DETERGENT PHOSPHATE LEVELS,

North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.

D. E. Francisco, and C. M. Weiss.

Journal of Water Pollution Control Federation, Vol 45, No 3, p 480-489, 1973. 5 fig, 6 tab, 15 ref.

Descriptors: *Algae, *Detergents, *Phosphates, *Eutrophication, Waste water (Pollution), Bioassay, Waste water treatment, Tertiary treatment, Surveys, Laundering.

Identifiers: Non-phosphorus detergents.

The ability of treated (primary, secondary, and tertiary) domestic wastewater containing phosphate and nonphosphate detergents to support algal growth in receiving waters was determined by algal bioassay. Wastewaters containing phosphate and nonphosphate detergents were collected from a test population. In 12 out of 18 cases, phosphorus detergent wastewater allowed the same growth in algal assay as the nonphosphorus detergent wastewater. Tertiary treatment for phosphorus removal resulted in significantly less growth than secondary treatment. The tertiary-treated phosphorus detergent wastewater allowed significantly greater growth than the nonphosphorus detergent wastewater at a 2% con-

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centration. The tertiary-treated nonphosphorus detergent wastewater allowed the same growth as the lake controls at all dilutions. At 1 and 2%, tertiary-treated phosphorus detergent wastewater allowed greater growth than one of the lake controls. Simply removing detergent phosphates from wastewater would have no practical significance in eutrophication control except in those cases where a lake is very strongly phosphorus-limited and wastewater is the principal source of influent phosphorus. Tertiary phosphorus removal to perhaps extremely low values (depending on dilution) can minimize nutrient enhancement of receiving waters. (Jones-Wisconsin)
W74-00724

THE EFFECTS OF STRIP MINING UPON NAVIGABLE WATERS AND THEIR TRIBUTARIES: DISCUSSION AND SELECTED BIBLIOGRAPHY.

Pittsburgh Univ., Pa. Graduate Center for Public Works Administration.

Available from the National Technical Information Service as AD-749 802, \$3.00 in paper copy, \$1.45 in microfiche. Prepared for Civil Works Directorate, Army Corps of Engineers, July 1972. 94 p. 1 fig, 10 tab, 278 ref. D+CW73-72-C-0048.

Descriptors: *Strip mine wastes, *Navigable waters, *Tributaries, *Bibliographies, Water pollution effects, Mine drainage, Runoff, Sedimentation, Water chemistry, Streams, Spoil banks, Land reclamation, Environmental effects, Erosion, Water quality, Legislation, Acid mine water, Eutrophication, Phosphates, Hydrogen ion concentration, Water utilization, Pollution abatement, Mining.

The principal effects of strip mining on waterways include alterations in runoff and sedimentation, water chemistry, stream ecology, and water utilization. The two principal approaches to abatement of strip mine effects are land reclamation and treatment of contaminated discharges. Land reclamation treats many of the effects of strip mining while treatment considers primarily the mine drainage problem. Strip mined land can be regraded and revegetated to control runoff and erosion and to reduce the formation of acid or highly mineralized drainage. Mine discharges which can be localized can be treated chemically or physically to remove suspended and dissolved solids. To reduce the concentrations of pollutants in streams, impoundment or dilution may be utilized. The most direct control is limitation by location and extent of strip mining. The several treatment methods, considered in the literature and in some cases applied as full or pilot scale treatment plants, include neutralization, distillation, ion exchange, reverse osmosis, electrodialysis and the physical processes of dilution, sedimentation and impoundment. A comprehensive bibliography of selected references is included, especially dealing with coal strip mining. (Jones-Wisconsin)
W74-00725

ENVIRONMENTAL CONTROL OF GAMETOGENESIS IN LAMINARIA SACCHARINA. II. CORRELATION OF NITRATE AND PHOSPHATE CONCENTRATIONS WITH GAMETOGENESIS AND SELECTED METABOLITES, Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences. S. I. Hsiao, and L. D. Druehl. Canadian Journal of Botany, Vol 51, No 5, p 829-839, 1973. 5 fig, 2 tab, 29 ref.

Descriptors: *Reproduction, *Marine algae, *Environmental control, *Nitrates, *Phosphates, Metabolism, Plant growth, Plant morphology, Sea water. Identifiers: *Laminaria saccharina, *Gametogenesis.

Using a synthetic seawater medium under optimal light and temperature conditions, the gametophyte growth, morphology, gametogenesis, and metabolites of *Laminaria saccharina* were studied in different concentrations of nitrate and phosphate in axenic culture. Nitrate and phosphate were required for the various stages of gametophyte development and gametogenesis. Meiospore germination was stimulated with increasing phosphate concentrations under optimal concentrations of nitrate, but inappropriate combinations of nitrate and phosphate concentrations produced an adverse effect. The optimal concentrations of nitrate and phosphate in ASP 2M medium for growing *L. saccharina* meiospores into gametophytes were 588.3 microgram-atoms nitrate nitrogen per liter and 15 microgram-atoms phosphate phosphorus per liter. The amount of nitrogen available to *L. saccharina* would determine the amount of lipid accumulation, since nitrogen deficiency limits growth, and causes photosynthetic activity to be directed to lipid synthesis. Nutrient concentrations giving rise to the greatest fertility also gave rise to the highest ratios of RNA/DNA and protein/RNA. Antherrhizal production occurred over a wider range of nitrate and phosphate concentrations than oogonial production. Percentage fertility was greater for the male gametophyte. This indicated that the female gametophyte was the limiting agent in sexual fusion. (Jones-Wisconsin)
W74-00726

CONTRIBUTIONS TO THE KNOWLEDGE OF BIOGENIC ELEMENTS AND PHTOPLANKTON ASSOCIATIONS DYNAMICS IN FRUSINET POND DURING NOVEMBER 1969-NOVEMBER 1970, (IN RUMANIAN), I. Chiosila, and A. Schneider.

Bul Cerct Pisic. Vol 30, No 3/4, p 45-62. 1971. (English summary).
Identifiers: Aphanizomenon-Flos-Aquae, *Biogenic elements, Chlorophyta, Chrysophyta, Cyanophyta, Nitrogen, Organic, Phosphorus, *Phytoplankton, Ponds, Reeds, *Romania (Mostistea River), Season, Zooplankton, Hydrogen ion concentration.

Relations between the dynamics of temperature, pH, N, P and organic matter and phytoplankton dynamics are established in Frusinet pond (on river Mostistea, Romania). Phytoplankton biomass varied depending on the season; generally, the physicochemical regime favored phytoplanktonic and zooplanktonic community development. Highest values of remnant phytoplankton frequency were recorded near the end of summer or early fall (about 7.03 mm³/l in Aug. for *Aphanizomenon flos-aquae*). The richest phytoplankton was found near the pond center followed by the reed plot zone and the littoral zone. The Cyanophyta, Chrysophyta, and Chlorophyta had nearly equal frequencies of 28.2%, 33.1% and 32.5%, respectively; Pyrophyta showed weak development.—Copyright 1973, Biological Abstracts, Inc.
W74-00727

INHIBITION OF OXYGEN EVOLUTION IN VOLVOX GLOBATOR BY CULTURE FILTRATES FROM PANDORINA MORUM, Kentucky Univ., Lexington. Dept. of Botany. D. O. Harris.

Microbiol, Vol 3, No 9, p 73-75, 1971. 1 tab, 8 ref. OWRR A-018-KY (5).

Descriptors: *Algal control, *Algal toxins, *Inhibitors, Cultures, Chlorophyta, Photosynthesis, Respiration, Biochemistry. Identifiers: *Pandorina morum, *Algal growth inhibitors, *Volvox globator.

A complex system of growth inhibition had been observed in the family *Volvocaceae* (colonial green flagellates). Culture filtrates from eleven different genera and species had been surveyed and it

was found that the culture filtrate from *Pandorina morum* produced the most effective toxin, inhibiting most members of the group while *Volvox globator* proved to be the most sensitive. An examination was made of the effects of the inhibitor produced by *Pandorina morum* on photosynthesis and respiration. The first firm evidence of a possible mode of action of an algal inhibitor, apparently a specific inhibitor of photosynthesis, is presented. Cultures of strains of *Volvox globator* and *Pandorina morum* were grown aseptically. The Clark electrode was employed to measure the rate of oxygen consumption and evolution. Respiration was measured as oxygen consumption and photosynthesis was measured as oxygen evolution. It was observed that one hour exposure of *Volvox* to culture filtrates of *Pandorina* resulted in a 65% reduction in the oxygen evolution rate which increased to 91% after 12 hour exposure to the inhibitor. Respiration as measured by oxygen consumption was unaffected. (Jones-Wisconsin)
W74-00728

NITROGEN FIXATION BY OSCILLATORIA (TRICHODESMIUM) THIEBAUTII IN THE SOUTHWESTERN SARGASSO SEA, Woods Hole Oceanographic Institution, Mass.

E. J. Carpenter. Deep-Sea Research, Vol 20, No 3, p 285-288, 1973. 2 tab, 14 ref.

Descriptors: *Nitrogen fixation, *Marine algae, *Cyanophyta, Photosynthesis, Analytical techniques, Nitrogen.

Identifiers: *Oscillatoria thiebautii, *Sargasso Sea, Acetylene reduction technique.

Oscillatoria (Trichodesmium) thiebautii, a planktonic blue-green alga, in Atlantic and Indian Oceans appears to fix atmospheric nitrogen, but at low rates relative to its total nitrogen budget. The importance of nitrogen fixation to *Oscillatoria* was investigated and data collected with the acetylene reduction technique in the southwestern Sargasso Sea presented. Concentrations of nitrate, nitrite, ammonia, and phosphate showed little variation from station to station. Nitrate and nitrite were relatively low. Two forms of *Oscillatoria* were collected, fusiform and spherical colonies and both fixed nitrogen. According to the characteristics of planktonic marine *Oscillatotria*, noted by Sournia, both fusiform and spherical colonies belong to *O. thiebautii*. Nitrogen fixation can be a significant source of nitrogen for *Oscillatoria*, permitting a doubling of cellular N at a minimum of 12 days and at an average rate of once every 47 days for all samples that fixed nitrogen. If *Oscillatoria* has division rates typical of other open ocean phytoplankton, then these data suggest that a large portion of its nitrogen must be obtained from sources other than nitrogen fixation, undoubtedly the uptake of combined N compounds. (Jones-Wisconsin)
W74-00729

ALGAE OF SECONDARY SETTLING TANKS, (IN RUSSIAN), Kharkov State Univ. (USSR). Dept. of Lower Plants.

For primary bibliographic entry see Field 05D. W74-00730

PROTECTION OF WATER AGAINST POLLUTION, A. Chojnicki. Gospodarka Wodna, Vol 30, No 1-2, p 42-49, 1970. 1 tab, 9 ref.

Descriptors: *Degradation (Decomposition), *Detoxification, *Water pollution effects, Industries, United States, Foreign countries, Water treatment, Sewage treatment, Formulation, *Water pollution control. Identifiers: *Poland, Detergent uses.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

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Detergent consumption creates new and growing problems of water purity in receiving and potable waters. Detergents contain two basic component groups: superficial-active components, averaging in content about 20%, and auxiliary mineral and organic components, mainly phosphate, carbonate, sulfite, and sodium borate mixtures. The principal criterion for classification of superficial-active substances is their ability of electrolytic dissociation in water solutions. Synthetic detergents remain unchanged in form in sewage system effluents. Generally, they are either not subject to dissolution or dissolve with difficulty, reaching lakes, rivers, and basins and causing disturbances in water self-purification and deterioration of water quality. Water treatment methods indicate that detergents mainly influence sedimentation, filtration, aeration, and coagulation. Numerous studies and investigations indicate a negative influence of detergents primarily on bacterial flora. It seems that a content of about 0.2 mg/l of superficial-active substances may be the admissible limit for superficial waters. Solutions should be based not on neutralization in sewage and purified water, but on research for new superficial-active products or bacterial flora producing easy biological decomposition of these products. (Jones-Wisconsin)
W74-00731

LET AS A DETERMINANT OF OXYGEN ENHANCEMENT RATIO AND SHAPE OF SURVIVAL CURVE FOR CHLAMYDOMONAS,
Medical Research Council, London (England). Experimental Radiopathology Research Unit.

P. E. Bryant.
International Journal of Radiation Biology, Vol 23, No 3, p 217-226, 1973. 6 fig, 1 tab, 16 ref.

Descriptors: *Cytological studies, *Radiation, *Oxygen, *Irradiation, *Chlamydomonas, Aerobic conditions, Anaerobic conditions, Helium, Mathematical studies.

Identifiers: *LET, *Oxygen-enhancement ratio, Chlamydomonas reinhardii, Deutrons, Neutrons, Electrons.

Radiation quality or LET has been widely recognized as a determinant of oxygen-enhancement ratio for biological materials. These experiments were designed to investigate changes in survival curves and oxygen-enhancement ratio over a range of LET values. The electron beam from the MRC linear accelerator was used as source of low-LET radiation. Cells were exposed to electron beam either while resting on membrane filters or in suspension. Dosimetry for the electron beam was based on a comparison of absorbed doses from this beam with those from the linear accelerator x-ray beam, using the ferrous sulphate method. Survival curves for Chlamydomonas were obtained for radiations having different values of LET alpha or stopping power. Irradiations were performed under either aerobic or anoxic conditions. Survival curves changed mostly in respect of extrapolation number or shoulder width, as LET was increased, the final slope remaining almost constant. The mode of variation in oxygen-enhancement ratio was strikingly similar to the pattern of variation in DQ as LET was increased. A straight line relationship was shown to exist between DQ value and oxygen-enhancement ratio when these values were computed for the same experiments at different values of LET alpha. (Jones-Wisconsin)
W74-00732

POLLUTION EFFECTS ON LITTORAL ALgal COMMUNITIES IN THE INNER OSLOFJORD, WITH SPECIAL REFERENCE TO ASCOPHYLUM NODOSUM,
Norway Inst. of Water Resources, Oslo.
J. Ruiness.

Helgolander wissenschaftliche Meeresuntersuchungen, Vol 24, No 1-4, p 446-454, 1973. 3 fig, 8 ref.

Descriptors: *Water pollution effects, *Phaeophyta, *Algae, Succession, Littoral.
Identifiers: *Norway (Oslofjord), *Littoral algae, *Ascophyllum nodosum, Fucus.

Qualitative changes are obvious when present floristic data is compared with what is known from the earliest collections of algae from the inner Oslofjord, as many easily recognizable species have disappeared or become very rare. In 1897 Ascophyllum nodosum was common and abundant but 20 years later the species had been forced further outward. Two causal categories may be operating as a result of pollution: Polluted water exerts a direct unfavorable effect on growth and development of the alga; polluted water has no direct unfavorable effect on growth and development but in polluted localities indirect biotic factors lead to an unfavorable competitive situation for the species. Growth and development of *Fucus distichus* spp. edentatus from germlings to fertility and its regrowth and succession in three localities were followed. Growth and development of transplanted Ascophyllum nodosum were compared with native plants in the Drobak area. Well-grown specimens of Ascophyllum nodosum were transplanted to the inner basin and no essential differences in vegetative growth and maturation of generative structures were observed. Increased competition for substrate and the shading effect of Enteromorpha reduces the potential *A. nodosum* germlings from becoming established. (Jones-Wisconsin)
W74-00733

ON ADVECTION IN PHYTOPLANKTON MODELS,
Florida State Univ., Tallahassee. Dept. of Meteorology.

J. O'Brien, and J. S. Wroblewski.
Journal of Theoretical Biology, Vol 38, No 1, p 197-202, 1973. 8 ref.

Descriptors: *Spatial distribution, *Advection, *Phytoplankton, *Mathematical models, Marine biology, *Food chains, Productivity, Diffusion, Turbulence, Model studies, Biomass, Dynamics, Velocity, Kinetics.

Identifiers: Non-dimensional ratio, Sargasso Sea, Gulf Stream, *Florida continental shelf.

The question explored is: When does advection need to be included in a marine food chain model. The thesis is offered that the non-dimensional ratio, S, is a measure of the importance of advection in determining the spatial structure of plankton distributions in marine food chain models. Scale analysis has been used to deduce this new non-dimensional number, S, whose magnitude indicates the importance of including advection in a marine ecosystem model. When S is greater than 1, advection greatly affects biological productivity; when S is less than 1, advection may be neglected. When S is order 1, advection and biological productivity play competing roles in determining the spatial configuration of the plankton biomass. Some real oceanographic situations where the a priori importance of advection in a spatial marine food chain model is uncertain are considered: for the Sargasso Sea, the parameter values obtained from* the resulting value of S indicates horizontal advection may be neglected when modeling phytoplankton. In the rapidly moving system of the Gulf Stream, the horizontal advection is a dominant factor. This technique is presently being utilized in a lower trophic level model of the West Florida continental shelf. (Jones-Wisconsin) *Munk and Carver (Tellus 2:158, 1950) and Thomas and Dodson (Biol Bull mar biol lab Woods Hole 134:199, 1968).

W74-00734

LAKE WASHINGTON,
W. T. Edmondson.

In: Environmental Quality and Water Development, W. H. Freeman, and Co. San Francisco, 1973. C. R. Goldman, editor, p 281-298, 1 fig.

Descriptors: *Eutrophication, *Recreation, Sewage, *Seawage treatment, *Political aspects, Pollution, *Washington, Water quality, Lakes, Diversion, Phytoplankton, Detergents, Planning, Land use, History, Environmental effects.

Identifiers: Puget Sound, Citizen action, Seattle (Wash), *Lake Washington (Wash), Oscillatoria rubescens.

Development of Seattle and nearby communities led to the use of Lake Washington for sewage disposal in ever increasing quantities from early in the 1900's until the 1960's in spite of diversion of Seattle's sewage to Puget Sound in 1936. Between 1941 and 1954 ten secondary biological sewage treatment plants were established on the lake. However pollution problems multiplied as urban growth continued. Levels of phytoplankton abundance increased drastically in the 1950's. A relatively dense growth of the blue-green alga Oscillatoria rubescens heralded a further deterioration of the lake. Diversion of additional sewage to Puget Sound between 1963 and 1968 resulted in considerable decreases in phosphate concentrations, nitrate and carbon dioxide levels in winter. Summer abundance of phytoplankton also dropped sharply with corresponding increases in water transparency. Detrimental impact on Puget Sound appears minimal. Primary treatment is given to Seattle's outflow which is deposited 3,600 feet offshore at a depth of 240 feet. Diversion of sewage followed increasing public concern and action and state legislation permitting communities to joint together and form a municipality to finance and carry out certain functions. A Seattle area municipality was established by a 1958 vote. The Lake Washington experience can be used as an example of how volunteer citizen action can lead to major accomplishments in protecting the environment. Ways in which this experience may be applied in other places are discussed. A brief review of the controversy about the use of phosphorus-containing detergents is included. (Edwards-North Carolina)
W74-00739

RECONNAISSANCE ANALYSIS OF EFFECTS OF WASTE-WATER DISCHARGE ON THE SHALLOW GROUND-WATER FLOW SYSTEM, LOWER LAS VEGAS VALLEY, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.

For primary bibliographic entry see Field 05B.
W74-00748

PROJECT REPORT FOR VENTURA COUNTY PLANNING DEPARTMENT AND CASITAS MUNICIPAL WATER DISTRICT ON WATERSHED DEVELOPMENT IMPACT ON LAKE CASITAS.
Montgomery Research, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 05B.
W74-00752

CHEMICAL AND BIOLOGICAL PATTERNS IN THE LOWER COLORADO RIVER SYSTEM,
Arizona Univ., Tucson.

L. G. Everett, J. S. Carlson, and H. K. Qashu.
Journal of the Arizona Academy of Science, Vol 8, No 2, p 91-94, June 1973, 2 fig, 3 tab, 2 ref.

Descriptors: *Eutrophication, *Nutrients, *Algae, *Salinity, *Colorado River basin, Artificial lakes, Lake stages, Sewage, Sediments, Plankton, River systems.

Domestic, industrial, and agricultural activity in the upper Colorado River basin states causes a rise in salinity of nearly 240 ppm above Hoover Dam due to salt loading. About 10.4 million tons of salt per year pass the dam itself. Increasing develop-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

ment and water use in the upper and lower basins should cause a progressive increase in water salinity in the river hydrologic system. Spatial and temporal variabilities in system properties are real and are considered of primary importance in the study presented. These changes are caused by the nature of changes in water, sediment, solute, sewage effluent, and recreational product inputs. Degradation of the phytoplankton and zooplankton were observed and changes in species dominance was illustrated across Lake Mead and in other parts of the Lower Colorado River System. Causes of these changes are speculative and may be associated with changes in concentration of essential nutrient species. Limited amounts of some essential micronutrients were documented in areas showing undesirable changes in plankton species. The increase in many ions may cause the absence of changes in biota or serve to enhance the limiting effects of low concentrations of micronutrients. (Muller-Arizona)
W74-00760

PRELIMINARY SURVEY OF MERCURY AND OTHER METALS CONTAINED IN ANIMALS FROM THE FRASER RIVER MUDFLATS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
T. R. Parsons, C. A. Bawden, and W. A. Heath.
Journal of the Fisheries Research Board of Canada, Vol 30, No 7, p 1014-1016, July 1973. 1 tab, 2 ref.

Descriptors: *Water pollution effects, Pacific Coast Region, *Mercury, Aquatic animals, *Benthic fauna, *Municipal wastes, *Sewage, Heavy metals, Aquatic life, Metals, Cations, Coasts, *Canada, Clams, Oysters, Crabs, Pollutant identification, Pollutants, Water pollution, Bays.
Identifiers: Vancouver (British Columbia), *Fraser River (British Columbia), Cowichan River (British Columbia), Kitimat River (British Columbia).

Crabs, oysters, clams, and other benthic animals from Sturgeon Bank (north of the Fraser River main arm) were found to contain larger amounts of mercury and other metals (notably Ag, Cd, and Cu) than did similar specimens from similar British Columbia coastal environments (Roberts Bank, south of the Fraser, Cowichan Bay mudflats, and Kitimat Arm). These higher metal levels are believed to be associated with the municipal sewer outfall from Vancouver. (Brown-IPC)
W74-00764

ORGANOCHLORINE RESIDUES IN HARP SEALS (PAGOPHILUS GROENLANDICUS) CAUGHT IN EASTERN CANADIAN WATERS,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
R. Frank, K. Ronald, and H. E. Braun.
Journal of the Fisheries Research Board of Canada, Vol 30, No 8, p 1053-1063, August 1973. 8 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *DDT, *Dieldrin, *Marine animals, Aquatic animals, Water pollution effects, Seawater, Pollutant identification, Animal metabolism, Metabolism, Persistence, Pesticides, Age, Aging (Biological), *Canada.
Identifiers: *Seals (Animals).

Numerous seals from newborn to age 18 years were obtained from the Gulf of St. Lawrence and the Newfoundland and Labrador coasts, and analyzed for DDT and its metabolites. Total DDT levels in blubbers exceeded 2 ppm in Gulf bedlamers and wild beavers, compared to less than 2 ppm for corresponding coast animals. DDT levels increased to 8.7 ppm as the animals matured, but leveled off in females at 6.5 ppm as they

reached breeding age. Dieldrin levels were only 5% of those for total DDT and did not accumulate appreciably in either wild or captive seals. PCB residues were only slightly less than total DDT and showed a similar increase with animal age. Residues in tissues of captive seals were as much as eight times higher than in nature, indicating either that natural diets contain lower residues than the selected diet of captive seals, or that chlorinated organics are assimilated at different rates in wild vs. captive animals. Brain lipids contained only 7-20% of all three chlorinated hydrocarbons found in the extractable fat of blubber, muscle, and liver, indicating a brain barrier. (Brown-IPC)
W74-00766

SOME COMPARISONS IN THE THERMAL STRUCTURE OF LAKES WOOD, KALAMALKA, OKANAGAN, SKAHA, AND OSOYOOS, BRITISH COLUMBIA,
Departmet of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W74-00769

SALTWATER POND RESEARCH,
Texas Parks and Wildlife Dept., Austin.
For primary bibliographic entry see Field 08I.
W74-00815

BIOLOGICAL INVESTIGATIONS OF LAKE WINGRA,
Wisconsin Univ., Madison. Lab. of Limnology.
J. F. Koone, M. Teraguchi, P. C. Baumann, and A. D. Hasler.
Copy available from GPO Sup Doc as EPI.23:73-044, \$1.45 microfiche, from NTIS as PB-224 930/8, \$1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-044, August 1973. 118 p, 51 fig, 6 tab, 77 ref. EPA Project 16010 EHR.

Descriptors: Aquatic life, Aquatic algae, Crustaceans, Fish, Aquatic environment, *Biological communities, Theoretical analysis, *Nutrient requirements, *Succession, Lakes, *Wisconsin, Model studies, *Optimization, Phytoplankton, Benthos, Zooplankton, Energy budget.
Identifiers: *Lake Wingra (Wis).

An investigation of seasonal changes in species diversity and biomass of phytoplankton, zooplankton, benthos, and fish in Lake Wingra, Madison, Wisconsin, was conducted during 1970 and 1971. The objective was to obtain ecological data on the biological components of an aquatic ecosystem and to utilize these data along with concurrent chemical data to aid the development of systems models of nutrient and energy fluxes in lake drainage basins. Interpretations of the data reveal several important considerations for models of lake system and future studies of Lake Wingra. Phytoplankton associations, for example, appear to be adaptive, self-organizing systems. Such behavior suggests the possibility to apply optimization principles to phytoplankton models. The data suggest, furthermore, that optimization analysis can be based on size particle distributions of the phytoplankton, which, rather than species, appears to be the basis of phytoplankton categories. Zooplankton and benthos analyses, on the other hand, indicate that energy and nutrient fluxes may be adequately approximated by simulating only a few species. Finally, results of fish studies imply that models of whole lake ecosystems must account for the mobility of predators in estimating their impact on prey populations, which should be characterized by differing spatial and temporal susceptibility to predation. (EPA)
W74-00833

EFFECTS OF THERMAL EFFLUENTS ON BIOECOSESSES OF WATER BODIES (O KHARAKTERE VLIYANIYA TERMAL'NYKH SBROSINKH VOD NA BIOTSENOZY VODOYEMOV),
Akademii Nauk SSSR, Moscow. Institut Vodnykh Problem.
N. S. Zolotareva, A. P. Musatov, and M. V. Sanin. Vodnyye Resursy, No 1, p 65-75, 1973. 3 tab, 52 ref.

Descriptors: *Thermal pollution, *Heated water, *Pollutants, *Water pollution effects, *Bodies of water, Temperature, Water temperature, Water cooling, Aquatic life.
Identifiers: USSR, *Biocenoses, Hydrobiotics.

Heated effluents can have beneficial as well as undesirable effects on hydrobiotic activity. Moderate heating within limits of the temperature optimum for organisms stimulates growth of hydrobiotics in the absence of pollution and retards their growth in polluted waste water. Heating above the temperature optimum inhibits biological processes and impoverishes ecosystems by reducing the number of species. Further heating of water results in hydrobiotic decline. In winter the effects of moderate heating are more beneficial than in summer. An increase in water temperature of 1 to 3 deg C has no significant effect on hydrobiotic activity. Observations and experimental studies by Soviet and foreign authors on effects of water temperature on marine organisms are reviewed. (Josephson-USGS)
W74-00842

SOUTHERN CALIFORNIA'S DETERIORATING MARINE ENVIRONMENT, AN EVALUATION OF THE HEALTH OF THE BENTHIC MARINE BIOTA OF VENTURA, LOS ANGELES AND ORANGE COUNTIES,
Center for California Public Affairs, Claremont. R. C. Fay.
1973. 76 P, 7 FIG, 3 PLATE, 8 TAB, 98 REF, 1 APPEND.

Descriptors: *California, *Marine biology, *Biota, *Aquatic habitats, Oceans, Marine fish, Aquatic life, Marine plants, Kelps, Biological communities, Biomes, Ecology, Environmental effects, Water resources, Water management (Applied), Marine algae.
Identifiers: *Southern California.

This description of the health of the local marine biota was prepared in a framework of consideration of the natural components of the marine environment of southern California and from the viewpoint of the effects of man's actions upon the total biota of the inshore area. This report is offered to encourage the development of an understanding of the biological importance of the various marine habitats of southern California, the major biological groupings now found in these habitats, the relationship of these organisms to one another and to their environment, and the extraordinarily high potential for biological productivity of the local ocean versus that of the land. Attention is called to the large number of species of marine organisms found in the local ocean as an indication of the complexity of the problems in resource management. Several projects are proposed for modification of the shoreline. The proposed projects will have biological effects and some may modify areas of the shoreline which are still in a primitive condition. (Reed-Florida)
W74-00877

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY--PROCESSES AND RESOURCES, VOLUME II.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00891

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

BACTERIA, YEASTS, VIRUSES AND RELATED MICROORGANISMS OF THE CHESAPEAKE BAY.
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W74-00893

FUNGI OF THE CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Botany.
For primary bibliographic entry see Field 02L.
W74-00894

NANOPLANKTON OF THE CHESAPEAKE BAY.
Maryland Univ., College Park. Dept. of Botany; and Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00895

PHYTOPLANKTON OF THE CHESAPEAKE BAY.
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 02L.
W74-00896

BENTHIC MACROALGAE OF THE MARYLAND PORTION OF THE CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Botany.
For primary bibliographic entry see Field 02L.
W74-00897

MACROALGAE OF THE CHESAPEAKE BAY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W74-00898

BRYOPHYTES AND LICHENS OF THE CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Botany.
For primary bibliographic entry see Field 02L.
W74-00899

VIRUSES OF AQUATIC PLANTS OF THE CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Botany.
For primary bibliographic entry see Field 02L.
W74-00900

SUBMERGED VASCULAR PLANTS OF THE CHESAPEAKE BAY AND TRIBUTARIES,
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W74-00901

EMERGENT VASCULAR PLANTS OF CHESAPEAKE BAY WETLANDS,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 02L.
W74-00902

VASCULAR PLANTS OF THE CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Botany.
For primary bibliographic entry see Field 02L.
W74-00903

FREE-LIVING PROTOZOA OF THE CHESAPEAKE BAY EXCLUSIVE OF FORAMINIFERA AND THE FLAGELLATES,
Maryland Univ., College Park. Dept. of Zoology.
For primary bibliographic entry see Field 02L.
W74-00904

FORAMINIFERA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Dept. of Paleobiology.
For primary bibliographic entry see Field 02L.
W74-00905

CTENOPHORES OF THE CHESAPEAKE BAY,
Richmond Univ., Va.
For primary bibliographic entry see Field 02L.
W74-00906

CNIDARIA OF THE CHESAPEAKE BAY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W74-00907

PRIAPULIDA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W74-00908

TARDIGRADA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W74-00909

KINORHYNCHA OF THE CHESAPEAKE BAY,
Smithsonian Institution, Washington, D.C. Office of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W74-00910

DIGENETIC TREMATODES OF THE CHESAPEAKE BAY,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 02L.
W74-00911

MOLLUSCS OF THE CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00912

POLYCHAETES OF THE CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00913

FREE-LIVING COPEPODA OF THE CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00914

DECAPOD CRUSTACEANS OF THE CHESAPEAKE BAY,
National Marine Fisheries Service, Washington, D.C.
For primary bibliographic entry see Field 02L.
W74-00915

FISHES OF THE CHESAPEAKE BAY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W74-00916

AMPHIBIANS OF THE CHESAPEAKE BAY REGION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00917

REPTILES OF THE CHESAPEAKE BAY REGION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00918

CURRENT STATUS OF THE KNOWLEDGE OF THE BIOLOGICAL EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS IN CHESAPEAKE BAY,
Maryland Univ., Prince Frederick. Hallowing Point Field Station.
For primary bibliographic entry see Field 02L.
W74-00920

CURRENT STATUS OF KNOWLEDGE CONCERNING THE CAUSE AND BIOLOGICAL EFFECTS OF EUTROPHICATION IN CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 02L.
W74-00921

CURRENT STATUS OF KNOWLEDGE OF THE BIOLOGICAL EFFECTS OF HEAVY METALS IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
For primary bibliographic entry see Field 02L.
W74-00922

BIOLOGICAL MODELS OF FRESHWATER COMMUNITIES,
Washington Univ., Seattle. Coll. of Fisheries.
F. B. Taub.

Copy available from GPO Sup Doc as EP-1.23:660-73-008, \$1.05; microfiche from NTIS as PB-225 029/8, \$1.45. Environmental Protection Agency, Ecological Research Series Report EPA-660/3-73-008, August 1973. 73 p, 31 fig, 15 tab, 7 ref. EPA Project 16050 DXM.

Descriptors: *Model studies, *Algae, *Protozoa, *Chlamydomonas, Ciliates, Bacteria, Nitrates, Light intensity, Primary productivity, Secondary productivity, Cultures, Pesticide toxicity, *DDT, *Polychlorinated biphenyls, Water pollution effects.
Identifiers: Chemostats, *Tetrahymena vorax.

Data from continuous cultures of an alga (*Chlamydomonas reinhardtii*) and protozoan (*Tetrahymena vorax*) have been used to construct a model of algal standing crop over ranges of light intensity, dilution rate, and nutrient concentration both in the absence and presence of predation by the protozoa. The model predicts that predation can reduce algal standing crop only within certain ranges of the environmental variables. The comparative toxicities of Aroclor 1242, a polychlorinated biphenyl, and DDT, were tested on the alga and protozoan, and also on daphnids, ostracods, and guppies. (EPA) W74-00923

DYNAMIC WATER QUALITY FORECASTING AND MANAGEMENT,
Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.

D. J. O'Connor, R. V. Thomann, and D. M. Di Toro.
Copy available from GPO Sup Doc as EP-1.23:660-73-009; \$2.05; microfiche from NTIS as PB-225 048/8, \$1.45. Environmental Protection Agency, Ecological Research Series Report EPA-660/3-73-009, August 1973. 20 p, 51 fig, 14 tab, 91 ref. EPA Project R800369.

Descriptors: *Water quality, *Mathematical Models, *Computer Models, Water pollution, *Cycling nutrients, Eutrophication, Dispersion,

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

Mass Transfer, Nutrients, Oxygen demand, Photosynthesis, Simulation analysis, Estuaries, Dissolved oxygen, Nitrogen, Phosphorus, Carbon. Identifiers: Delaware River estuary, Potomac River estuary.

The formulation and initial verification of two modeling frameworks are described. The first is directed toward an analysis of the impact of the carbonaceous and nitrogenous components and wastewater on the dissolved oxygen resources of a natural water system. The second modeling framework concentrates on the interactions between the discharge of nutrient, both nitrogen and phosphorus, and the biomass of the phytoplankton and zooplankton populations which result, as well as incorporating the overall impact on dissolved oxygen. The models are formulated in terms of coupled differential equations which incorporate both the effect of transport due to tidal motion and turbulence, and the kinetics which describe the biological and chemical transformations that can occur. The modeling frameworks are applied to the Delaware and Potomac estuaries in order to estimate the ability of such models to describe the water quality effects of carbon, nitrogen, and phosphorous discharges. The agreement achieved between observation and calculation indicate that the major features of the impact of wastewater components on eutrophication phenomena can be successfully analyzed within the context of the models presented. (EPA)

W74-00927

TOXICITY AND ACCUMULATION OF LEAD IN THE COMMON MUSSEL *MYTILUS EDULIS* IN LABORATORY EXPERIMENT, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
M. Schulz-Baldes.
Mar Biol (Berl). Vol 16, No 3, p 226-229. 1972. Illus. (English summary).
Identifiers: Laboratory tests, *Lead, Lethal limit, Mortality, *Mussel, *Mytilus-Edulis*, Time, *Toxicity.

In a laboratory experiment, conducted over 130 days, 3 batches of a total of 100 common mussels, *M. edulis*, were maintained in media containing different Pb concentrations. Two vessels served as controls. There was no acute injury to the mussels; but, over an extended period of time, a marked increase in mortality occurred which was related to the Pb concentration in the medium. The median lethal time (LT50) was computed to be 218 days for the control, 150 days with 0.5 mg Pb/l in the medium, 129 days with 1 mg/l, and 105 days with 5 mg/l. Quantitative analyses of the soft parts of *M. edulis* by flameless atomic-absorption-spectrophotometry revealed a distinct accumulation of Pb from a natural Pb content of 8.4 microgram Pb/g dry weight, the Pb concentration increased to 12,840 microgram/g at 0.5 mg/l, to 20,770 microgram/g at 1 mg/l and to 39,830 microgram/g at 5 mg/l. The ratio of the concentration of Pb in the soft parts of *M. edulis* to the concentration in the medium remained in the same order of magnitude both under laboratory conditions using high Pb concentrations and in situ Pb levels. Over a period of 130 days, Pb uptake expressed as percentage of Pb offered was 10.9% at 0.5 mg/l, 9.5% at 1 mg/l, and 3.4% at 5 mg/l, respectively.—Copyright 1973, Biological Abstracts, Inc.

W74-00927

COPPER CONTENT OF OYSTERS (*CRASSOSTREA ANGULATA*) ALONG THE HUELVA COASTS, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain).
R. Establier.
Invest Pesq. Vol 36, No 2, p 293-296. 1972. Illus. (English summary).

Identifiers: Coasts, *Copper, *Crassostrea-Angulata*, *Oysters, *Spain (Huelva Coast), *Toxicity.

Oysters (*C. angulata*) collected in the area around Huelva (Spain) contain very high (toxic) amounts of Cu (average 144.9 mg/100 g fresh body weight).—Copyright 1973, Biological Abstracts, Inc.

W74-00978

HEALTH ASPECTS OF FISH PRODUCTS FROM POLLUTED WATER, C. Sebastian.

Vet Ital. Vol 23, No 1/2, p 120-128. 1972.

Descriptors: Disposal, Fish, *Food chains, *Italy, *Marine pollution, Poluted coasts, Sewage, Toxicity, Public health, Water pollution effects.

In Italy, 74% of the coastal cities discard their sewage into the sea; only 13.6% of the 8000 km of shoreline is free of pollution. The accumulation of pollutants in the marine food chain is discussed. Strict controls (chemical, toxicological, epidemiological) on fish used for human consumption are suggested.—Copyright 1973, Biological Abstracts, Inc.

W74-00979

SIGNIFICANCE OF DOCKS IN DISSEMINATION OF DIPHYLLOBOTHRIASIS NEAR RIVERS AND LARGE TRANSPORT WATER BODIES (ACCORDING TO DATA FROM THE VOLGA PIERS AND THE VOLGOGRAD RESERVOIR), (IN RUSSIAN),

Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
E. P. Razumov, and I. Ya. Mikhailenko.
Med. Parazitol. Parazit. Bol'szn, Vol 41, No 1, p 90-94, 1972, English summary.
Identifiers: *Diphyllobothriasis, Diphyllobothrium-latum, Dissemination, Docks, Fecal, Health, *Human diseases, Occupational categories, Piers, Reservoirs, Rivers, *USSR (Volgograd).

In 1966-1968 in Volgograd and Kyybishev regions of USSR, the population was examined and data from the local sanitary-epidemiological conditions were analyzed. The rate of diphyllobothriasis infestation was established: in fishermen, 10-45%; in dock workers 1.5-1.2%; and in members of crews, 0.6%. Specimens of water (451) and of bottom soil were analyzed in the laboratory. Eggs of Diphyllobothrium latum were found in 180 specimens. Docks were important sources of fecal contamination of the coast shallow waters of the Middle and Lower Volga. Fishermen, dock workers and crews of the navigating boats must be examined for hematinic diseases and undergo clinical follow-up treatment.—Copyright 1973, Biological Abstracts, Inc.

W74-00991

DYNAMICS OF CHANGES IN CORTICAL ACTIVITY IN ALBINO RATS WITH CHRONIC SILVER INTOXICATION (IN UKRAINIAN),

L. A. Kul's'kyi, P. D. Kharchenko, and P. Z. Stepanenko.

Dopov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol, Vol 34, No 7, p 660-662, 1972, English summary.

Identifiers: Albino rats, Brain, *Cortical activity, Inhibition, Liver, *Rats, Reflex, *Silver, *Potable water.

The effect of ionic Ag of various concentrations in drinking water (0.5, 2, 20 mg/l) on the conditioned reflex activity of albino rats was studied. An Ag dose of 0.5 mg/l does not affect the conditioned reflexes; an Ag dose of 2 mg/l evokes a disturbance in the conditioned reflex activity after 4-mo. intoxication. An Ag dose of 20 mg/l causes inhibition of excitation at the end of the second mo. of intoxication; as the intoxication time increases, an intensification in the excitation

process, differentiation disinhibition and increase in intersignal response quantity are seen. After 5-6 mo. intoxication, the inhibition of positive conditioned reflexes with a progressing growth in inhibition intensity again arises. After 9-mo. intoxication with doses of 20 mg/l, Ag accumulated in brain (24%) and liver (80%) tissues compared with animals which drank the usual town water.—Copyright 1973, Biological Abstracts, Inc.

W74-00997

THE EFFECT OF NUTRIENTS ON THE GROWTH OF BACTERIAL POPULATION IN WATER,

Polsish Academy of Sciences, Warsaw. Inst. of Ecology.

W. A. Godlewski-Lipowa.

Bull Acad Pol Sci Ser Sci Biol, Vol 20, No 7, p 473-475, 1972, Illus.

Identifiers: *Bacterial growth, *Nutrients, Trophic types, Water pollution effects, Lakes, *Bactopeptone.

Increase in the number of bacterial cells, obtained after few-hours exposure of isolated water samples, void of zoo- and phytoplankton, was directly proportional to the trophic type of the water-culture medium. The most stimulating effect was produced by bactopeptone, then KNO₃ and KH₂PO₄, and the least (NH₄)₂SO₄. The lower the trophism degree of the lake the more effective was the addition of these substances for bacterial populations.—Copyright 1973, Biological Abstracts, Inc.

W74-01001

TROPHIC STRUCTURE AND BIOACTIVITY OF THE PLANKTON COMMUNITIES IN LOWER REACH OF ELBE ESTUARY: CRITERIA FOR SAPROBIC CLASSIFICATION OF A TIDAL WATER (IN GERMAN),

I. Noethlich.

Arch Hydrobiol Supplement B, Vol 43, No 1, p 33-117, 1972, Illus, English summary.

Identifiers: Estuaries, Algae, Diatoms, Actinocyclus-normannii, Bacteria, Coscinodiscus-lacustris, *Germany Elbe estuary, *Plankton communities, *Saprobic classification, Tidal water, *Trophic structure.

Analysis of the trophic structure of the limnetic plankton community of the Elbe estuary, West Germany, was carried out in 1967. The inflow of organic detrital material favors omnivorous consumers, the biomass of which dominate (75% of total consumer biomass). On account of the specific estuarine conditions there will be a rapid destruction of organic material by bacteria leading to mineralization, with the consequence that inorganic P- and N-substances will not be lacking. Consequently, a specific bloom of autochthonous diatoms (Actinocyclus normannii, Coscinodiscus lacustris) may take place. These algae are apparently not utilized by herbivorous organisms. Measurements of bioactivity indicate an eudynamic and eutrophic situation. The estuary is classified as alpha-mesosaprobic.—Copyright 1973, Biological Abstracts, Inc.

W74-01003

FOUR METASAPROBIC COMMUNITIES OF COLORLESS FLAGELLATES,

For primary bibliographic entry see Field 05B.

W74-01006

ECOLOGICAL STUDY OF THE CYANOPHYTES AND CHLOROPHYTES IN SOME PONDS AROUND BRUGES: DETERMINATION OF THE DEGREE OF TROPHISM IN ACCORDANCE WITH SCHROEVER'S PD QUOTIENT, (IN GERMAN),

Ghent Rijksuniversiteit (Belgium).

D. Somers.

Biol Jaarb. 39 p: 238-260, 1971, Illus.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

Identifiers: *Belgium (Bruges), Chlorophyta, *Chlorophytes, Cyanophyta, *Cyanophytes, Desmidiales, Ecological studies, Ponds, Protococcales, Schroevers PD quotient, *Trophism.

Samples were taken every 4 wk in 4 ponds around Bruges, Belgium, for a year. Some physical and chemical factors were determined. Of the phytoplankton, bioturbation and metaphyton, the Cyanophyta and Chlorophyta were examined qualitatively. The dominant organisms were studied semiquantitatively. The abioticum and the phyto-organisms were compared and an attempt to determine the trophism by Schroevers PD (Protococcales: Desmidiales) quotient was made.—Copyright 1973, Biological Abstracts, Inc.
W74-0102

PRIMARY PRODUCTION-PHYTOPLANKTON RELATIONSHIP IN THE CRAPINA-JIJILA COMPLEX IN THE FLOOD CONDITIONS OF 1970, (IN RUMANIAN),
Bucharest Univ. (Rumania). Faculty of Biology.
For primary bibliographic entry see Field 021.
W74-01015

SOME PHYTOPLANKTON CHARACTERISTICS IN COOLER BASINS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
E. I. Fedorova.
Gidrobiol Zh. Vol 8, No 2, p: 28-33. 1972. (English summary).
Identifiers: Dystrophic state, *Eutrophication, *Phytoplankton, *Heated water, *Cooling basins, Thermal pollution.

Introduction of hot water into lakes is known to cause increases in number and biomass of phytoplankton; heat-loving species, not representative of the surrounding region, often appear. An example is given of a lake, used for some time as a cooling basin, which was dystrophic in 1931, but is now highly eutrophic.—Copyright 1973, Biological Abstracts, Inc.
W74-01017

THE EFFECT OF ATRAZINE AND DIURON ON THE PRODUCTIVITY OF CLADOCERA. (EXPERIMENTAL STUDIES), (IN RUSSIAN),
Akademiya Nauk UkrSSR, Kiev. Instytut Hidrobiologii.
E. P. Shcherban'.
Identifiers: *Atrazine, Ceriodaphnia-Quadrangula, *Cladocera, *Diuron, Moina-Macrocopha, Productivity, Scapholeberis-Mucronata, *Herbicide toxicity.

The effect of small concentrations of diuron (0.05-0.25 mg/l) and atrazine (1 mg/l) upon the productivity of Cladocera (*Moina macroscopha* (Straus), *Ceriodaphnia quadrangula* (Müller), and *Scapholeberis mucronata* (Müller)) was studied for a 1-15 mo. period. For *S. mucronata* and *C. quadrangula*, reproduction increased in the first generation and drops rapidly thereafter. In *M. macroscopha* adaptation in 2-4 generations and an increase in reproduction was observed. The most susceptible to poisons was *S. mucronata*, which should make a good specimen in toxicological studies of herbicides.—Copyright 1973, Biological Abstracts, Inc.
W74-01024

CHARACTERISTICS OF THE TOXIC EFFECTS AND SAFETY LEVELS OF NITRILES OF CROTOMIC ACID AND ISOCROTOMIC ACIDS IN WATER BODIES, (IN RUSSIAN),
Kharkovskii Meditsinskii Institut (USSR).
N. F. Loskutov, and N. N. Pit'en'ko.
Gig Sanit. Vol 37, No 4, p 10-14. 1972. Illus. (English summary).

Identifiers: *Crotonic acid, Guinea-Pigs, *Nitriles, Rats, *Toxicity, *Isocrotonic acid, Mice, Lethal limit.

The effects of nitriles of crotonic and isocrotonic acids on the organoleptic properties of water, the sanitary regimen of water bodies and on rats, guinea pigs and mice were studied. Introduced orally under conditions of acute, subacute and chronic poisoning, the nitriles had a common general toxic action on the bodies of warm-blooded animals, with a dominating effect on the CNS. The maximum permissible concentration of both substances in water bodies is 0.1 mg/l.—Copyright 1973, Biological Abstracts, Inc.
W74-01044

BOTTOM FAUNA OF DEAD VISTULA,
Warsaw Univ. (Poland). Zoological Inst.
L. Klekot.
Pol Arch Hydrobiol. Vol 19, No 2, p 151-166, 1972. Illus.
Identifiers: *Bottom fauna, *Poland (Dead Vistula), *Salinity, *Oxygen, *Water temperature.

The environmental factors in Dead Vistula, Poland, salinity, O₂ content, temperature of water and character of bottom were investigated. The qualitative species composition of macrobenthos was analyzed. Special attention was paid to the dependence of the occurrence of common organisms in Dead Vistula on salinity. Seasonal investigations on the dynamics of numbers and biomass distinguished the dominant groups in the overgrown parts and in the parts without plants in 3 regions in various seasons. Considerable differentiation of the bottom fauna and great seasonal changes were observed.—Copyright 1973, Biological Abstracts, Inc.
W74-01073

INTRODUCTION TO STUDY 'IN SITU' OF PLANKTON ECOLOGY IN LAKE GENEVA, (IN FRENCH),
For primary bibliographic entry see Field 02H.
W74-01079

PRIMINARY SYSTEM DEVELOPMENT, CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05B.
W74-01092

5D. Waste Treatment Processes

THE WATER BUDGET AND WASTE TREATMENT AT A MODERN DAIRY,
Mississippi State Univ., State College. Water Resources Research Inst.

J. B. Allen, J. F. Beatty, S. P. Crockett, and B. L. Arnold.
Available from the National Technical Information Service as PB-224 792, \$3.00 in paper copy, \$1.45 in microfiche. Completion Report, July 1973. 30 p, 15 fig, 3 tab, 7 ref. OWRR A-065-MISS (1).

Descriptors: Water demand, *Dairy industry, Lagoons, *Hydrologic budget, *Waste treatment, *Mississippi, *Waste water treatment, Industrial wastes, Biochemical oxygen demand.

This study was concerned with an analysis of the dairy water budget and an evaluation of the efficiency of a 2-cell lagoon waste treatment system for a modern 130-cow dairy at Holly Springs, Mississippi. The water budget at the dairy was determined by means of water meters installed on the main supply line, the alley flushing system, the milking parlor flush tanks, the prep stalls, the milk-room and the waterers. Data collection began on June 15, 1972, and continued through June 15,

1973. The water budget was summarized on a weekly basis by means of a computer print-out. For an average of 114 cows, the average water usage was 16,738 gallons per day (gpd). The amounts of water used in the various components of the dairy were: alley flushing systems, 5,372 gpd; milking parlor flush tanks, 6,869 gpd; prep stalls, 809 gpd; milk-room hot water, 320 gpd; cattle waterers, 2,113 gpd; and miscellaneous, 1,255 gpd. The BOD of the milking parlor wastes entering the first cell of the waste treatment system averaged 699 mg/l, and the BOD of the free stall alley wastes entering the first cell averaged 758 mg/l. The overall treatment efficiency of cell 1 (reduction in BOD) was 62.9%. The overall treatment efficiency of cell 1 plus cell 2 was 86.5%.
W74-00560

MECHANISM OF ORGANIC ADSORPTION ON ACTIVATED CARBON,
Maryland Univ., College Park. Dept. of Civil Engineering.

J. T. Cookson, Jr.
Available from the National Technical Information Service as PB-224 813, \$5.25 in paper copy, \$1.45 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 17, April 1973. 59 p, 10 fig, 13 tab, 36 ref. OWRR A-014-MD (1). 14-31-0001-3020.

Descriptors: *Waste water treatment, *Activated carbon, *Chlorinated hydrocarbon pesticides, *Organic compounds, *Toxins, Water pollution sources, Water supply, *Adsorption, Tertiary treatment, Water purification, Methodology, Evaluation.

Identifiers: *Synthetic organic pollution.

Some knowledge is provided on the physicochemical nature of organic adsorption from aqueous solution on activated carbon. Carbon surface characteristics, as well as interactions with adsorbates were studied. Filtrasorb 200, a commercial activated carbon produced from coal by high temperature steam activation, was used as the adsorbent with various adsorbates. Surface characteristics of the commercial activated carbon were modified by outgassing at different temperatures, and by dry and solution oxidation. Equilibrium and kinetic studies are conducted in batch systems, under controlled conditions of pH, ionic strength and temperature. The adsorption of mercaptan is complex. Three simultaneous phenomena occur: adsorption of the mercaptan, its oxidation to disulfide catalyzed by the activated carbon and adsorption of disulfide. Mechanisms for the catalytic activity of activated carbon involving the quinone groups and metal ions are proposed. The adsorption of mercaptan is studied in the absence of oxygen. Copper and iron on the surface of the carbon significantly influence the adsorption of butyl disulfide. The adsorption energy and the adsorption rate decrease when metals are eliminated, indicating ion-induced dipole interactions. Para-hydroxybenzaldehyde exhibits highest affinity probably due to a strong interaction of the aromatic ring with the carbon's surface carbonyl groups. The rate of adsorption of butyl disulfide, carbon surface oxides cause a reduction of more than two logs on the rate of adsorption. Rate of adsorption of p-hydroxybenzaldehyde is only slightly affected by the presence of the acidic surface oxides. (Woodard-USGS)
W74-00565

SPRAY DISPOSAL OF SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.

E. A. Myers.
In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

graphed Report, p 92-99, February 1973. 1 fig, 2 tab, 9 ref. 14-31-0001-3823.

Descriptors: *Water reuse, *Spraying, *Sprinkler irrigation, *Waste water disposal, Path of pollutants, Waste treatment, Sprays, Infiltration, Recharge.

Identifiers: *Spray irrigation.

Spray irrigation for final disposal of sewage effluent is safe and appropriate when the systems are adequately designed and conscientiously operated. Only certain pollutants can be removed appropriately by the absorptive, biological, chemical, and physical reactions with the mantle. Other pollutants can completely destroy this living filter, thus producing additional pollution rather than renovation. Reuse of renovated water usually is governed by need, economics, and local legal limitations. Potential outlets include industrial, domestic, and agricultural uses. Ultimately salt may be a problem with reuse of reclaimed sewage effluent unless it is properly blended with freshwater or desalinated, as each time it goes through a cycle of domestic use it picks up about 300 ppm of salt. (See also W73-09113) (Knapp-USGS) W74-00572

WASTEWATER TREATMENT TECHNOLOGY (SECOND ADDITION), Illinois Inst. of Tech., Chicago.

J. W. Patterson, and R. A. Minear.

Available from NTIS, Springfield, Va., 22151 as PB-216 162 Price \$9.00 printed copy; \$1.45 microfiche. Illinois Institute for Environmental Quality, Final Report IIEQ 73-1, February 1973. 363 p.

Descriptors: *Waste water treatment, *Industrial wastes, *Water pollution treatment, Methodology, Arsenic compounds, Boron, Cadmium, Fluorides, Iron, Lead, Manganese, Mercury, Nickel, Oil wastes, Hydrogen ion concentration, Phenols, Dissolved solids, Zinc, Water quality control, Water pollution control.

Identifiers: Barium, Cyanide, Selenium, Silver.

This revised edition is a state-of-the-art survey of industrial waste treatment literature pertaining to 23 materials found in industrial wastes: arsenic, barium, boron, cadmium, chloride, chromium (hexavalent), chromium (trivalent), copper, cyanide, fluoride, iron (soluble), iron (total), lead, manganese, mercury, nickel, oily wastes, pH control, phenols, selenium, silver, total dissolved solids, and zinc. Information on existing methods of treatment, levels of treatment attainable, and associated costs is presented. (Woodard-USGS) W74-00582

ON THE ISOLATION OF VIRUS FROM SEWAGE TREATMENT PLANT SLUDGES,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark).
For primary bibliographic entry see Field 05A.
W74-00628

LEAST-COST ALLOCATION AND VALUATION MODEL FOR WATER RESOURCES,
city Univ. of New York. Dept. of Mathematics.
H. P. Young, and R. G. Thompson.
Water Resources Research, Vol 9, No 5, p 1186-9985, October 1973. 2 fig, 13 ref.

Descriptors: *Economic efficiency, Water quality, Waste treatment, *Waste assimilative capacity, *Regions, Technology, Costs, Optimization, Marginal costs, Water allocation (Policy), Water values, Equations, Mathematical models, Systems analysis, Water demand.

Identifiers: *Environmental quality, *Quadratic programming, *Cost minimization, Nonlinear programming.

An optimization model is presented which considers both economic efficiency and environmental quality. The model allows for trade-offs between the technologies of water use and waste treatment and the capacities of different regions for waste assimilation in determining how much water will be used and how much waste to discharge in each region. The objective is to determine the combination of production processes in each region that minimizes the over-all cost of meeting the demands for goods and for water quality, subject to resource availability by region. The input-output coefficients of water-using production processes are written as functions of intake water quality so that the feedback effects of waste discharge on the economic process itself may be evaluated. The incorporation of the feedback effects necessitates a nonlinear formulation of the problem; it is shown that a nonlinear formulation can be obtained to a good approximation by a linearly constrained quadratic program. This model could be used to evaluate water development projects on a consistent basis; in particular it would calculate the marginal values of water in different regions and the marginal costs of meeting different water quality objectives. Since it includes the economic trade-offs between different technologies and production regions, such a model provides an accurate determination of the value of water in different uses. (Bell-Cornell)
W74-00670

THE EFFECTS OF WATER TEMPERATURE AND ELEVATION UPON AERATION, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

J. S. Hunter, and J. C. Ward.

Available from the National Technical Information Service as PB-224 814, \$4.75 in paper copy; \$1.45 in microfiche. Presented at the Symposium on Wastewater Treatment in Cold Climates, University of Saskatchewan Saskatoon, Saskatchewan, Canada, August 22, 1973. 46 p, 8 fig, 2 tab, 24 ref. OWRR A007 COLO (3), 14-31-0001-3506.

Descriptors: *Aeration, *Water temperature, Altitude, *Oxygen, *Dissolved oxygen, *Air temperature, *Elevation, Waste water treatment.

Identifiers: *Oxygen transfer, Low water temperature, High elevation, Oxygen aeration, Mechanical aeration, Atmospheric pressure.

A laboratory-scale mechanical aeration system was used to examine the variation in oxygen transfer rates into water as a function of water temperature (0 to 40°C). The over-all volumetric mass transfer coefficient, liquid phase base, increased linearly with water temperature at a rate of 2.84% per C. The relative aeration efficiency decreases with increasing elevation, water temperature, and dissolved oxygen concentration. For zero dissolved oxygen and elevation, the rate of oxygen transfer per unit volume and time is independent of water temperature for 0 to 50°C. Equations were developed relating saturation dissolved oxygen concentration to temperature and atmospheric pressure to elevation and air temperature. An equation was developed for predicting average annual air temperature (for locations in the U.S.) from elevation, longitude, and latitude: $T = 96.3 - 1.352N + 0.142W - 1.59E$ where $T \pm$ air temperature, F; $N \pm$ degrees north latitude; $W \pm$ degrees west longitude, and $E \pm$ elevation in thousands of feet. W74-00699

SUMMARY REPORT: PILOT PLANT STUDIES ON DEWATERING PRIMARY DIGESTED SLUDGE,

Los Angeles County Sanitation District, Calif.
J. D. Parkhurst, R. F. Rodrigue, R. P. Miele, and S. T. Hayashi.

Copy available from GPO Sup Doc as EPI.23:670 73-043, \$2.10; microfiche from NTIS as PB-224

798, \$1.45. Environmental Protection Agency, Technology Series report EPA-670/2-73-043, August 1973. 202 p, 40 fig, 57 tab, 51 ref. EPA Program Element 1B2043, Contract R801658.

Descriptors: Pollution abatement, *Sludge treatment, *Dewatering, *Sludge disposal, Heat treatment, Polymers, Flyash, Filters, Incineration, Landfills, Pipelines, Land reclamation, *Pilot plans, *California, Estimated costs, Centrifugation.

Identifiers: *Los Angeles, Sludge processing, Pilot study, Performance data, *Primary digested sludge.

A 14-month pilot and plant scale sludge dewatering study was conducted at the Joint Water Pollution Control Plant (JWPCP) — a 380 mgd primary treatment facility owned and operated by the Los Angeles County Sanitation Districts. Ocean discharge requirements on the effluent from this facility necessitated that at least 95 percent of the suspended solids be removed from the primary digested sludge for disposal by alternative means. The applicability of heat, polymers, chemicals and flyash was investigated as a means of conditioning digested sludge for dewatering. Sludge dewatering schemes utilizing horizontal scroll centrifuges, imperforate basket centrifuges, vacuum filters and pressure filter were thoroughly studied. Operational results were obtained from twenty conditioning-dewatering test systems of which five successfully produced the desired suspended solids removal. Full scale cost estimates were prepared for each of the five systems. Estimates were prepared for the requirements and costs associated with the ultimate disposal of dewatered sludges generated from each successful dewatering scheme. Three disposal alternatives were considered, namely, truck hauling of dewatered sludge from the JWPCP to a landfill; pipeline transport of digested sludge to a landfill with dewatering and disposal there at; and incineration at the JWPCP with truck hauling of the ash residue to a landfill. Combining the disposal costs with the dewatering costs yielded estimates for fifteen total sludge handling systems. Remote area transportation and disposal costs were derived for comparative purposes. It was concluded that a 2-stage centrifuge sludge dewatering scheme (polymer addition to the second stage) with truck hauling of dewatered sludge solids to a landfill was most suitable for the JWPCP. (EPA)
W74-00700

ALGAE OF SECONDARY SETTLING TANKS, (IN RUSSIAN), Kharkov State Univ. (USSR). Dept. of Lower Plants.

T. V. Dohadina, and N. A. Chukhlibova.

Ukr Bot Zh. Vol 28, No 6, p 749-752. 1971. (English summary).

Identifiers: *Algae, Chlorophyceae, Cyanophyceae, Diatoms, Diversity, Euglenophyta, *Settling tanks, *USSR (Kharkov), Yellow-Green algae, Treatment facilities.

Results are presented of studying species composition, seasonal dynamics and quantity of algae in secondary settling tanks of 2 canalization stations of biological sewage treatment in Kharkov: Glavnaya and Bezlyudovskaya (USSR). In all 80 spp. and intraspecific taxa of 5 algae were found, among them 4 of Euglenophyta, 36 of Chlorophyceae, 5 of yellow-green algae, 30 diatoms, 5 of Cyanophyceae. Most frequent algae species are presented. It was established that in the secondary settling tanks periphyton is more developed than phytoplankton with respect to both quantity and species diversity. Plankton and periphyton of the secondary settling tanks are formed due to wash out of algae of a biological film from biofilters.—Copyright 1973, Biological Abstracts, Inc.
W74-00730

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

REPORT TO THE GOVERNOR AND THE LEGISLATIVE COMMISSION: POLLUTION ABATEMENT PROJECT, LAS VEGAS WASH AND BAY.

Las Vegas Valley Water District, Nev.

December, 1972. 18 p, 1 fig, 1 tab, 3 append.

Descriptors: *Planning, *Water supply, *Water pollution, *Environmental effects, Treatment, Desalination, Water reuse, Evaporation, *Nevada. Identifiers: Lake Mead, *Las Vegas Valley District (Nev), Las Vegas Wash.

In 1971, the Southern Nevada Water System to import Lake Mead water to Las Vegas Valley and Boulder City became operational under the management of Las Vegas Valley Water District (LVVWD). Lake Mead, now the source of about one-half of the Valley's potable water supply, could become the source of 85% within a few decades. This report is sixth in a series on the development of a plan to eliminate pollution of Lake Mead in the vicinity of Las Vegas Wash. The conceptual plan calls for a water reclamation program including demonstration wastewater treatment and desalt plants, the encouragement of in-valley uses of treated wastewater, the development of Las Vegas Wash as a recreational area and wildlife habitat, and the export of remaining waters to Dry Lake for evaporation. The abatement program is on schedule but legislative and gubernatorial approval of means to finance the project together with continued cooperation of government agencies and citizen groups is necessary to meet the proposed schedule. The Project Report and Design Index, which combined make up the definitive work on the project, plus the Environmental Assessment are summarized. Three related subjects are treated in the appendices: (1) chemical, physical and biological conditions of waters of Las Vegas Bay of Lake Mead; (2) ecology of Las Vegas Wash under alternative actions in water quality management, and (3) hydraulic characteristics of shallow groundwater flow system in lower part of the Valley. (Hoffmann-North Carolina)

W74-00744

SEWER SYSTEM COST ESTIMATION MODEL.

Voorhees (Alan M.) and Associates, Inc., McLean, Va.

Prepared for Regional Planning Council, Baltimore, Md. April, 1969. 132 p, 5 fig, 11 tab, 13 ref.

Descriptors: *Planning, *Sewerage, *Computer models, *Cost analysis, *Maryland, Dynamic programming, Land use, Design criteria, Equations, Projections, *Regional analysis. Identifiers: Land use plans, *Baltimore (Md).

A computerized model to estimate the cost of alternative wastewater collection systems is described. The model can be used as a planning tool in that it can project the cost of constructing and maintaining a given sewer system for a given land use pattern. The inputs to the model include a land use pattern or projection which is converted into expected wastewater flows, a digital description of the topography of the area, and a diagrammatic plan of the proposed sewer system. The model uses dynamic programming and various engineering constraints and cost-estimating equations in an attempt to find the least cost solution. The outputs from the model include the size of each pipe in the sewer system, the location of pumps, and the cost of the system both in terms of present worth and operation and maintenance. The use of the model for regional planning is quite significant as it can quickly determine the impact of existing or future land use patterns on existing or proposed sewer systems, or conversely, can determine sewer system requirements for alternative land use plans. (Elfers-North Carolina)

W74-00745

SOLID WASTE MANAGEMENT PLAN, COWLITZ AND WAHKIAKUM REGION.

Cowlitz, Wahkiakum Regional Planning Commission, Kelso, Wash.

1973. 92 p, 24 FIG, 29 TAB, 4 APPEND.

Descriptors: *Solid wastes, *Landfills, *Washington, *Columbia River, Leaching, Waste disposal, Ravines, Marshes, Dikes, Urbanization. Identifiers: Kelso-Longview Urban Area (Wash), *Cowlitz and Wahkiakum Region (Wash), Sanitary landfill, Tightlines, Hilltops, Riversides.

Needs are identified for disposing of solid wastes in a two-county region in the Columbia River Valley, including the Kelso-Longview Urban area, where manufacturing of aluminum, paper, lumber and wood products and agriculture are the basic industries. Alternative proposals for solid waste storage, collection, transportation, and disposal, are developed and evaluated. Criteria for determining acceptability of alternatives were: (1) pollution of streams and rivers, (2) legal restrictions on garbage burning, (3) facilitation of vector and disease control, (4) location, maintenance, and operation so as to protect public health, prevent air and water pollution, and avoid creation of public nuisances, and (5) prevention of land pollution and economic resource conservation. Planning procedure included collection of data regarding current waste management practices, land resources, and potential waste generation. Recommendations for immediate action relevant to present practices are made. Eventual creation of one central sanitary landfill is favored; environmental hazards and economic costs of hilltop, ravine, riverside, and marsh landfill sites are evaluated. Potential for surface water contamination is considered. Consequently, tightlines are proposed for ravine sites and dikes, ditches, sumps, and retention ponds for riverside sites. A six-year capital improvements program and long-term administrative measures are recommended. Model ordinances for counties and towns regarding solid waste disposal are appended. (Stein-North Carolina)

W74-00747

LAMAR COUNTY: LAND USE SURVEY AND ANALYSIS, LAND USE PLAN, HOUSING, WATER AND SEWER, OPEN SPACE.

West Alabama Planning and Development Council, Tuscaloosa.

June, 1973. 272 p, 35 fig, 30 tab.

Descriptors: *Water supply, *Sewerage, *Waste water treatment, *Alabama, Planning, Water demand, Environmental effects, Financing, Costs, Coordination, Water quality, Urban land use, Rural areas.

Identifiers: *Utility extension, Lamar County (Ala.).

Objectives of the Lamar County Water and Sewer Plan are: to provide adequate water and sewer service to all county residents, to maximize the use of existing water resources, and to promote a coordinated approach to developing plans and designing a good area wide water and sewer system. Interests of the public and individual customers of water systems can best be served by self-sustained, utility-type enterprises whose gross revenue should cover operating and maintenance expenses, fixed charges on capital treatment, and system development. Proposed system changes must be approved by state health and water improvement agencies. Financing the expansion of a water system in areas of rapid growth is a problem. Incorporated areas, Beaverton, Detroit, Kennedy, Millport, Sulligent, and Vernon, have water supply systems. Only the last two have sanitary sewer systems. There is no county water system or sanitary sewer system serving rural areas. Storm drainage is a system of open ditches and culverts related to the railroad and highway system. Water

from subsurface aquifers contains excessive iron. Proposed water service areas for the county, an inventory of the various existing water and sewer systems accompanied by appropriate maps and data, and a short range development program for each for the period 1972-1982 are presented, and the possibility of connecting some of the systems to achieve a joint water supply system is discussed. No area wide sewer system is feasible, based on present cost estimates and existing development pattern. (Edwards-North Carolina)

W74-00750

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.

Central New York Regional Planning and Development Board, Syracuse.

Report No. CNYRPDB-RP-72-HUD-246-03. November, 1972. 21 p, 2 fig, 2 tab. 424-1;424.2, NYP-246.

Descriptors: *Planning, *Water supply, *Sewerage, *Regional development, *New York, Land use, Urbanization, Administration, Project planning, Priorities.

Identifiers: *Urban guidance systems, Central New York Region.

The Regional Planning Board's primary objective in planning for regional water and sewerage systems is the promotion of orderly urban development in accordance with the Regional Land Use Plan. The Board views the major elements of water and sewerage systems, such as treatment plants and trunk lines, to have a region-shaping quality much more significant than traditional land use controls, e.g. zoning. Thus, the plans are closely related to land use plans and focus on existing, short-term, and long-term service areas. Unified area-wide water and sewerage systems are not presently possible because of the fragmentation of existing systems and administrative arrangements, but the Board is taking the lead to move in that direction via various coordination, information, and planning programs. The Board expects that the counties will play a key role in the implementation of regional systems. The Board presents a program of specific projects for the period 1973-1978. Projects are ranked in terms of importance on the basis of five criteria: effect on public health and sanitation, effect on water quality, conformance with regional comprehensive plans, relation to the provision of housing, and citizen approval and involvement. (Elfers-North Carolina)

W74-00753

WASTE WATER CLARIFICATION AND SOLIDS RECOVERY WITH 'WASTE WATER BENTONITE': REPORT ON A STUDY TRIP TO SWEDEN (ABWASSERKLAERUNG UND STOFFFREUKEGEWINNUNG MIT 'ABWASSER-BENTONIT': BERICHT UEBER EINE REISE NACH SCHWEDEN),

Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.

H.-L. Dalpke.

Wochenblatt fuer Papierfabrikation, Vol 100, No 11/12, p 400-402, June 15, 1972. 1 tab, 2 fig, 2 ref.

Descriptors: *Pulp wastes, *Flocculation, *Waste water treatment, Treatment facilities, Water pollution treatment, *Bentonite, Clays, Water purification, Industrial wastes, Liquid wastes, Pulp and paper industry, Europe, Coagulation, Flotation, Sedimentation, Polymers, Polyelectrolytes, Adsorption, Ion exchange, Biochemical oxygen demand, Suspended solids, Effluents, Costs, Capital costs, Operating costs, Temperature, Hydrogen ion concentration, Foreign research.

Identifiers: *Flygt process, *Retamix process, Germany, *Sweden, Polyacrylamide, Westerviks Pappersbruks AB. (Sweden), Board mills, Waste paper.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

The Swedish 'Flygtol' process, a variant of the 'Retamix' process, is based on a patented Hungarian invention by Prof. Libor and makes use of a specially activated, complex-forming, and highly swellable bentonite having a surface area of 100-120 sq m/g, which is marketed by Erbsloeh und Co., Geisenheimer Kaolinwerk, Geisenheim/Rhein, West Germany. Its flocculating power derives from both Van der Waals adsorption forces and ion-exchange capacity, while its high specific gravity (2.6 g/cu cm) aids the rapid formation of microflocs which can be further coagulated by polyacrylamide or a similar polyelectrolyte, and separated by sedimentation or, in special cases, by flotation. The process is said to be insensitive to temperature variations between zero and 30°C and to pH variations between 1 and 14. The process operates on an industrial scale at Westerviks Papperabruk AB., Sweden, which manufactures boxboard and linerboard from recycled waste papers. Waste waters containing 700-1700 mg/liter of insoluble solids are treated with 60 g/cu m of activated bentonite to achieve a solids reduction to an average of 2 mg/liter. The resulting sludge is reused as filler, and 20-75% of the clarified water is reused in the mill. The bentonite treatment also reduces the effluent BOD from 190-270 to 60-75 mg oxygen per liter. Capital plus operating costs of the installation total 6 German pfennigs per cu m. (Speckhard-IPC)

W74-00762

REDUCING EVAPORATION PLANT POLLUTION PLANT POLLUTION AND ITS TREATMENT,

Rosenlew (Oy. W.) A.B., Pori (Finland).

A. A. R. Ronnholm.

Paperi ja Puu (Papper och Tra), Vol 54, No 11, p 715-730, Nov. 1972. 12 fig, 3 tab, 13 ref.

Descriptors: *Pulp wastes, *Water pollution sources, *Evaporation, *Water pollution treatment, *Biochemical oxygen demand, *Economic feasibility, Incineration, Pulp and paper industry, Industrial wastes, Waste water (Pollution), Costs, Cost-benefit analysis, Byproducts, Capital costs, Operating costs, Fuels, Steam, Water pollution, Europe, Effluents, *Waste water treatment.

Identifiers: Furfural, Methanol (Or Methyl alcohol), Acetic acid, Kraft mills, Flue gas, Finland, Chemical recovery.

Prospects are discussed for low-pollution evaporators and evaporation processes for spent pulping liquors, including the purity and utilization of evaporator condensates, the treatment of noncondensable stack gases, and the removal or recovery of BOD-consuming condensate components, notable furfural, acetic acid, and methanol. It is concluded that currently available equipment and technology can achieve 100% return of condensates while lowering BOD constituents by 75%. At this maximum BOD reduction, the treatment of stack gases and concentrated partial condensates would require a capital investment of ca. 2400 Finnish marks plus operating costs (mainly for pump power and stripper steam) of ca. 0.25 mark per ton of evaporated water. By burning the removal methanol, which has about half the heating value of oil, operating costs can be lowered to 0.20 mark per ton. As example, a draft mill manufacturing daily 1500 tons of pulp and discharging dilute black liquor containing 0.6 g of methanol per cu m into a river-lake system 100 m wide, 2 m deep, and containing 5 g oxygen per cu m, could prevent the depletion of 2 g/cu m oxygen by recovering 75% of the methanol produced (240 kg/hr) which would otherwise consume 180 kg/hr of oxygen and require a water flow past the mill of about 4000 km/year. (Brown-IPC)

W74-00763

ECONOMIC FEASIBILITY OF AN INTEGRATED COTTONWOOD PLANTATION UTILIZING A NUCLEAR POWER REACTOR,

Battelle-Pacific Northwest Labs., Teheran (Iran).

For primary bibliographic entry see Field 03C.

W74-00771

BANKS STUDY BASIN CLEANUP.

Environmental Science and Technology, Vol 7, No 8, p 802-803, September 1973. 2 tab, 1 fig.

Descriptors: *Financial feasibility, *Future planning, *Pollution abatement, *Costs, *River basins, *Economic feasibility, *Connecticut River, New England, Interstate Rivers, Financing, Mathematical models, Model studies, Capital costs, Operating costs, Forecasting, Economic prediction, Project planning, Water pollution control, Solid wastes, Air pollution.

The Connecticut River Basin Project, a consortium of banks in New Hampshire, Massachusetts, and Connecticut serving the fourteen-county Basin area, estimated that government plus industry will have to spend about \$1.3 billion to clean up the air, water, and solid waste pollution in the Basin. The one-year study, supported partly by EPA, cost about \$150,000, and was based on available geographic, demographic, and economic information plus a forecasting model developed by Chase Econometric Associates, Inc. Capital and operating cost data for existing plants and new industrial growth needed to abate air and water pollution are tabulated separately. Various alternatives for financing these expenditures are examined. (Brown-IPC)

W74-00772

KRAFT PULPERS AND POLLUTION PROBLEMS AND PRESCRIPTIONS,

R. L. Miller.

Chemical Engineering, Vol 79, No 28, p 52, 54, 56, Dec 11, 1972. 1 fig, 2 ref.

Descriptors: *Water pollution, *Pulp wastes, *Bleaching wastes, *Waste water treatment, *Water pollution sources, *Water pollution treatment, Water reuse, Pulp and paper industry, Air pollution, Sedimentation, Aerated basins, Activated sludge, Treatment facilities, Industrial wastes, Liquid wastes, Effluents, Biological treatment, Suspended solids.

Identifiers: Kraft mills.

Water and air pollution in the kraft pulping industry are discussed. Per ton of pulp manufactured, a kraft mill uses 15,000 to 35,000 gal of water for unbleached and 15,000 to 60,000 additional gal for bleached pulp. If discharged without pretreatment, these waters could contain 20-30 lb of solids per ton of unbleached plus 6-35 lb per ton of bleached pulp. Sedimentation, aerated basins, and activated sludge are the main external effluent treatment methods, but particulars of water-reuse systems vary from mill to mill. (Witt-IPC)

W74-00774

THE ABC WAY TO BETTER WASTEWATER TREATMENT,

Environmental Quality Engineering, Inc., Oakland, Calif.

J. F. Kerl.

American Dyestuff Reporter, Vol 62, No 8, p 24-25, August 1973. 1 fig, 1 illus, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, *Textiles, *Treatment facilities, Activated sludge, Aeration, Recycling, Suspended solids, Biochemical oxygen demand, Phosphates, Phosphorus, Flocculation, Sedimentation, Aerated basins, Sludge, Separation techniques, Sewage treatment.

Identifiers: *ABC (Accelerated Biological-Chemical process, Clarifiers.

The ABC (Accelerated Biological-Chemical) process developed by the University of California Sanitary Engineering Research Laboratory involves brief (30-60 min) detection aeration in the

presence of activated sludge, followed by rapid sedimentation and recycle of all but a small portion of the sludges from the sedimentation steps to the aeration unit. The process is not only cheaper and faster but also superior to conventional activated sludge treatments under shock loading and transient conditions. It consistently removes over 90% of BOD, suspended solids, and phosphorus from mixed municipal-industrial wastes at volume loadings of 400-500 lb/day/1000 cu ft of aeration basin capacity. The first-stage reactor (30-60 min retention time) comprises two or more aerated compartments with provision for return solids reaeration. The first-stage separator is designed to maintain the desired mixed liquor volatile suspended solids. The second process stage consists of a flocculator and a final clarifier, and the second-stage separator is a normal circular or rectangular clarifier. The ABC process is being demonstration-tested at American Enka Co.'s textile fiber plant, Enka, N.C. (Brown-IPC)

W74-00776

A NEW ERA FOR COOLING WATER TREATMENT,

Betz Labs., Inc., Trevose, Pa.

E. W. James.

The Betz Indicator, Vol 42, No 4, p 3-5, 8-10, July/August 1973. 5 fig. (Adapted from Plant Engineering, Nov 16, 1972).

Descriptors: *Cooling water, *Water treatment, *Industrial water, *Corrosion control, *Water pollution sources, *Chromium, *Toxicity, Zinc, Phosphates, Polymers, Calcium carbonate, Sludge, Dispersion, Nitrogen compounds, Phosphorus compounds, Surfactants, Lignins, Hydrogen ion concentration, Temperature, Waste water treatment, Aquatic life, Metallurgy, Steel, Chlorine, Oxidation, Fouling.

Identifiers: Corrosion inhibitors, Lignosulfonates, Tannins, Phosphonates, Polyphosphates, Sulfuric acid, Dispersants, Chromium compounds, Chromates.

In the selection of cooling water treatments for control of corrosion, scale, inorganic and microbiological deposits, and fouling, environmental quality standards must be considered along with water temperature, pH, chemical composition, and metallurgical factors. Effluents from chromate-treated waters may require special treatment of the blowdown by chemical reduction, followed by lime precipitation of chromic sulfate. Chromate doses in closed systems (200-300 ppm) can be reduced to 20-50 for open recirculating systems at pH 6.0-6.8 by addition of polyphosphate and zinc. An ultralow chromate treatment (5-10 ppm) has become feasible in conjunction with polymeric phosphonate dispersants which retain calcium carbonate in solution and eliminate the need for sulfuric acid. Nonchromate corrosion inhibitors are becoming more popular because of their lower toxicity to aquatic organisms. One such inhibitor is based on an organic nitrogen compound in mixture with polyphosphate and zinc for use at pH 6.5-7.0. Another formulation uses a phosphonate scale control agent together with a zinc-free polyphosphate for protecting steel at pH 7.5-8.5. Lignosulfonates and modified tannins have also been upgraded by addition of phosphonate/polymer dispersants, but suffer from ready oxidation (e.g., by chlorine) with formation of sludge-forming degradation products. (Brown-IPC)

W74-00777

POWER PLANT COOLING SYSTEM STILL USING SEWAGE EFFLUENT.

Zia Co., Los Alamos, N. Mex.

The Betz Indicator, Vol 42, No 4, p 6-7, July/August 1973. (Reprinted from Zia News, Vol 24, No 9, Dec 14, 1972).

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

Descriptors: *Cooling water, *Industrial water, *Corrosion control, *Waste water treatment, *Powerplants, *Water treatment, *Chromium, *Water pollution sources, *Water conservation, Toxicity, Effluents, Freshwater, Water consumption (except consumptive use), Legislation, Regulation, Water law, Pollution abatement.

Identifiers: Corrosion inhibitors, Chromates.

To conserve freshwater, about 121,000,000 gal/year of sewage effluent has been used to supply over 75% of the cooling water at the AEC Los Alamos nuclear power plant. Recent water quality regulations prohibiting the discharge of all but a minimum amount of chromium prompted the construction of facilities for removal of chromate corrosion inhibitor from the blowdown discharge. When chromium emissions were still too high to meet environmental standards, a chromium-free inhibitor formulation was substituted, which proved to be not only less toxic but also more economical and permitted higher solids concentrations in the cooling system, resulting in less effluent blowdown and still lower freshwater consumption. (Brown-IPC)

W74-00788

INFLUENCE OF EVAPORATION CONDENSATE ON BIOLOGICAL PURIFICATION OF PULP WASH WATERS (EINFLUSS VON EINDAMPFKONDENSAT AUF DIE BIOLOGISCHE REINIGUNG VON ZELLSTOFFWASCHWASERN),

Technische Universitaet, Dresden (East Germany).

H.-J. Walther, and D. Knaack.

Zellstoff und Papier, Vol 21, No 6, p 168-173, June 1972. 3 fig, 2 tab, 4 ref.

Descriptors: *Activated sludge, *Pulp wastes, *Biological treatment, *Waste water treatment, *Sulfite liquors, Biodegradation, Pulp and paper industry, Suspended solids, Effluents, Industrial wastes, Liquid wastes, Laboratory equipment, Foreign research, Europe.

Identifiers: Multistage processes, Wash water, Pulp washing, East Germany.

Laboratory studies indicated that the presence of diluted condensate from the evaporation of spent sulfite pulping liquor does not significantly reduce the biodegradation of solids suspended in pulp wash water during a two-stage activated sludge treatment. A high biological purification is achieved even when the composition of the activated sludge undergoes substantial changes as a result of variations in the effluent. (Speckhardt-IPC)

W74-00781

ENZYME-ENHANCED TURBIDITY REMOVAL THROUGH PRIMARY TREATMENT,

Weyerhaeuser Co., Miquon, Pa.

P. A. Schwonke, and W. S. Davis.

Tappi, Vol 56, No 1, p 93-95, Jan 1973. 1 tab, 6 ref.

Descriptors: *Pulp wastes, *Water pollution treatment, *Enzymes, *Waste water treatment, *Flocculation, *Suspended solids, Filtration, Pressure, Pulp and paper industry, Pennsylvania, United States, Dispersion, Surfactants, Color, Water reuse, Turbidity, Treatment facilities, Biodegradation, Industrial wastes, Effluents.

Identifiers: Starch, Amylase, Dispersants, Waste paper, Recycling, Clarifiers, White water, Cationic compounds, Pulpers, Hydrapulpers.

At the nonintegrated fine-paper mill of Weyerhaeuser Co. in Miquon, Pa., complete flocculation of suspended solids in the white water during primary clarifier treatment was hindered by a cationic starch present in the effluent, which originated from repulping of surface-sized dry broke. The starch was found to lose its dispersing power as the length of its macromolecular chain

was reduced by amylolysis. Hence amylase was added to the hydrapulper and then to the sewer pump ahead of the clarifier. This enzyme treatment improved the removal of suspended solids, including color bodies, with attendant reduction of effluent turbidity. In conjunction with pressure filtration, it enabled the white water to be recycled as papermaking process water. It may also permit future clarifier installations to be of smaller dimensions. (Brown-IPC)

W74-00783

RECYCLING FINE-PAPER MILL EFFLUENT BY MEANS OF PRESSURE FILTRATION,

Weyerhaeuser Co., Miquon, Pa.

W. S. Davis, R. S. Kraiman, J. M. Parker, and C.

H. Thorborg.

Tappi, Vol 56, No 1, p 89-92, Jan 1973. 3 fig, 1 tab, 1 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Filtration, *Water reuse, *Treatment facilities, Pulp and paper industry, Pennsylvania, United States, Biochemical oxygen demand, Enzymes, Chlorination, Chlorine, Slime, Surfactants, Filters, Pressure, Water treatment.

Identifiers: Starch, Dispersants, Cationic compounds, White water, Paper mills, Amylase.

Sand and gravel pressure filtration improved the quality of primary clarifier effluent to the extent that the filtrate could be reused as process water in the manufacture of printing and other fine papers. The BOD reduction thus achieved was about 16%. The filter installation has a designed throughput rate of 9 gal/sq ft/min, equivalent to about 1 million gal/day, compared to a total water consumption of 3 million gal/day by the paper mill. The filtered water is further improved by adding an amylase enzyme (6 ppm) to destroy the dispersant power of cationic starch present in the white water, and by treatment with chlorine (6 ppm) to prevent slime deposits. (Brown-IPC)

W74-00784

CLARIFICATION OF NSC WASTE LIQUOR BY ACTIVE CARBON, ETC., (IN JAPANESE),

Hokkaido Univ., Sapporo (Japan). Dept. of

Chemistry of Forest Products.

M. Hanzawa, S. Satonaka, K. Miura, S. Yasuda,

and S. Ishida.

Research Bulletins of the College Experiment Forest Hokkaido University, Vol 29, No 2, p 361-371 + 4 plates, 1972. 6 tab, 8 photomicrographs, 19 ref. (English summary).

Descriptors: *Pulp wastes, *Waste water treatment, *Activated carbon, *Sulfite liquors, *Ion exchange, Color, Pores, Porosity, Drying, Adsorption, Bark, Wood wastes, Foreign research, Coagulation, Oxidation, Industrial wastes, Oak trees, Hardwood.

Identifiers: NSSC pulping, Spent sulfite liquor, Spent pulping liquors, Decoloring, Ion exchangers, Charcoal, Japan.

The spent cooking liquor from the pulping of Japanese oak wood (*Quercus mongolica* var. *grosseserrata*) by the neutral sulfite semichemical (NSSC) process was treated with activated carbons which had been prepared from the bark of the same wood by reacting it with 70% sulfuric acid at 150, 170, or 190°C for 0.5, 1, 2, 4, or 8 hr to give carbon yields of 46.7 to 60.4%. Colorimetric absorbances at 400 and 273 nm wavelengths indicated excellent adsorption properties for the carbon obtained at 190°C in 0.5 hr. Among three different drying methods used, solvent dehydration with ethanol gave the best carbon; next best was freeze-drying; oven drying at 105°C was the least satisfactory. The relative ion-exchange capacity of the best C preparation was 0.235 meq/g for calcium chloride and 0.116 meq/g for sodium chloride. The hydrated preparations contained 62.2-63.8% C and 3.6-4.0% H. They showed a porous granular

structure in the scanning electron microscope, with pore diameters of about 0.1 micron, suggesting that the pores are filled with water under moist conditions. When the spent NSSC liquor was treated in three stages with coagulants (CaO, aluminum sulfate or chloride, or ferric sulfate), with oxidants (potassium permanganate or hydrogen peroxide), and with adsorbents (hydrated activated C), its residual color approached that of freshwater, although it retained small amounts of noncolored matter. (Brown-IPC)

W74-00785

UNIQUE WATER TREATMENT PLANT ENSURES PURITY OF LAKE BAIKAL,

N. Chistyakov.

Pulp and Paper International, Vol 14, No 7, p 29-30, July 1972. 1 illus. Trans. from Nauka i Zhizn, No 1, 1972.

Descriptors: *Pulp wastes, *Water pollution treatment, *Treatment facilities, *Waste water treatment, *Lakes, Waste water (Pollution), Pulp and paper industry, Byproducts, Discharge (Water), Industrial wastes, Filtration, Aeration, Oxygenation, Aerated lagoons, Biological treatment, Sedimentation, Coagulation, Color, Biochemical oxygen demand, Effluents, Water pollution, Water pollution sources, Activated sludge, Sludge disposal, Sludge treatment, Foreign countries.

Identifiers: Lake Baikal (USSR), Dissolving pulps.

The Baikal pulp mill produces dissolving-grade pulp for viscose rayon tire cord. Using 435-600 cu m fresh water per ton of pulp, the mill may take 200 cu m per min from Lake Baikal on reaching its 600 ton-per-day capacity. About 93-95% of dissolved organic substances are recovered and made into by-products, such as fodder yeast protein. The remaining effluent is pre-aerated, neutralized, filtered, sedimented, subjected to activated sludge treatment and decoloration by coagulation with aluminum sulfate, sulfuric acid, and polyacrylamide, and oxygenated in a 24-hr total treatment cycle. The purified effluent contains not more than 3-6 mg BOD per liter. It is discharged into the lake 160 m from the shore at a depth of 40 m with intensive (30:1) dilution via a dispersing mixer. Although part of the spent activated sludge is coagulated with ferric chloride and lime and marketed as a dry powder, over 15,000 tons of sludge have accumulated in four years of operation, augmented by 50-60 tons/year, for which a commercial outlet is being sought. (Witt-IPC)

W74-00786

BLEACHING EFFLUENT FOR IRRIGATION,

Stephen F. Austin State Coll., Nacogdoches, Tex.

J. C. Norris, K. G. Watterson, and H. V. Wiant, Jr.

Pulp and Paper, Vol 46, No 9, p 90, Aug 1972. 2 tab, 7 ref.

Descriptors: *Bleaching wastes, *Soil disposal fields, *Irrigable land, *Irrigation effects, *Forest soils, *Microorganisms, *Waste water disposal, Waste disposal, Ultimate disposal, Industrial wastes, Liquid wastes, Irrigated land, Pulp and paper industry, Pulp wastes, Texas, United States, Irrigation, Chlorination.

Effluents from pulp bleaching plants, notably those discharged from the chlorination and alkaline extraction stages, were shown to have no detrimental effects on the activity of microorganisms in three Texan forest soils (a Eustis sand, a Mantachie fine sandy clay loam, and a Blake clay). These findings offer encouragement that bleaching wastes may, after some long-term research, be disposed of routinely as irrigation water on forested lands. (Witt-IPC)

W74-00787

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

CENTRIFUGE DEWATERS SLUDGE AT RATE OF 10 TONS PER DAY,

American Can Co., Ashland, Wis.

V. Schmidt.

Pulp and Paper, Vol 46, No 8, p 56-57, July 1972. 4 illus.

Descriptors: *Pulp wastes, Treatment facilities, *Sludge treatment, Water pollution treatment, *Centrifugation, *Waste water treatment, Solid wastes, *Waste disposal, *Landfills, Sludge disposal, Dewatering, Industrial wastes, Water pollution sources, Recycling, Wisconsin, Pulp and paper industry, Effluents, Suspended solids, Ultimate disposal.

Identifiers: Centrifuges, Paperboards, Waste paper, Napkins, Paper napkins, Boxboard, Repulping.

Waste paperboard from American Can Co.'s boxboard and carton factory is repulped and separated into fibers and contaminants. The reclaimed fibers are recycled into paper napkins. Clay, printing ink, plastic coatings, titanium dioxide pigment, and other contaminants are removed from the effluent in a clarifier. The clarifier sludge is dewatered in a model P5400 Sharples Super-D-Canter centrifuge and disposed of as landfill. (Witt-IPC)
W74-00788

SWITCHING FROM CALCIUM BISULFITE TO TWO-STAGE SODIUM-CALCIUM BISULFITE PULPING TO REDUCE WATER POLLUTION (ZNISENIE ZNECISTENIA ODPADNYCH VOD PRECHODOM Z CA-BISULFITOVEHO VARENIA NA DVOJSTUPNOVE NA-CA-BISULFITOVE),

Vyskumny Ustav Papiera a Celulozy, Bratislava (Czechoslovakia).

L. Balhar, R. Borisek, H. Majlingova, and J.

Strenger.

Papia a Celuloza, Vol 27, No 6, p 121-123, 1972. 2 fig, 2 tab, 6 ref.

Descriptors: *Digestion, *Pulp wastes, *Sulfite liquors, *Water pollution, *Waste water treatment, Biochemical oxygen demand, Sodium compounds, Calcium compounds, Pulp and paper industry, Industrial wastes, Softwood, Conifers.

Identifiers: Pulp yield, Pulpwood, Spruce trees, Sulfite mills, Spent sulfite liquors, Raw material conservation, Multistage processes.

Experimental laboratory digestions of spruce wood were conducted in order to compare the relative water pollution loads of spent cooking liquors discharged in the conventional calcium-base sulfite process compared to a two-stage sulfite cook using sodium plus calcium bisulfites. At pulp yields of 55 and 60%, the five-day BOD of the two-stage spent liquor was found to be 20 and 30% lower, respectively, than that of the discharge from the single-stage calcium-base digestion to 50% pulp yield. Since the mixed-base process allows the wood to be cooked to higher yields without impairment of pulp quality, thus conserving more fibrous new material, it is highly recommended to sulfite pulp and paper mills having no spent liquor combustion facilities. (Trubacek-IPC)
W74-00789

FINNISH DIRECTIONS IN SOLVING WATER POLLUTION PROBLEMS,

Central Association of Finnish Woodworking Industries, Helsinki.

E. Malmi.

Paper Trade Journal, Vol 156, No 49, p 36-37, Nov 27, 1972. 1 tab.

Descriptors: *Pulp wastes, Water pollution control, *Pollution abatement, *Economic feasibility, Water pollution treatment, *Waste water treatment, *Investment, Capital cost, Costs, Pulp and paper industry, Europe, Foreign countries, Sulfite liquors, Biochemical oxygen demand, Suspended

solids, Liquid wastes, Industrial wastes, Legislation, Regulation, Water law, Permits, Treatment facilities, Planning, Long-term planning, Future planning.

Identifiers: *Finland, Chemical recovery, Spent sulfite liquor, Spent pulping liquors, Sulfite mills, Kraft mills, Paper mills, Board mills.

Between 1960 and 1969, the production of sulfite pulp, kraft pulp, paper, and board in Finland has increased by 10, 130, 98, and 128%, respectively. Although the attendant discharge of BOD loads into water courses increased only 10%, it amounted to 407,000 tons in 1969, despite legal requirements imposing a discharge permit since the 1962 Finnish Water Act. The pollution-control program planned for the 1970's expects the industry to invest about \$160,000,000 for effluent treatment facilities; two-thirds of this will go for mechanical treatment plants designed to halve the present annual discharge of 300,000 tons of suspended solids; the remainder will be used to increase the recovery of spent sulfite liquors from 76 to 85% or better in the country's fifteen sulfite mills. Only after internal control measures have been applied will the industry focus its attention on external treatment of effluents, spending an estimated \$50,000,000 for reducing dissolved organic matter through chemical and/or biological processes. While some sulfite mills may be able to switch from calcium to a soluble-base cooking liquor and to pollution-free oxygen bleaching, other older or smaller mills may have to shut down. (Witt-IPC)
W74-00790

OXYGEN-CONSUMING ORGANIC MATTER (BOD) IN EFFLUENTS ORIGINATING IN DIFFERENT PULPING PROCESSES OF THE WOODWORKING INDUSTRY: REVIEW OF LITERATURE DURING THE YEARS 1960-1970, Finnish Pulp and Paper Research Inst., Helsinki. For primary bibliographic entry see Field 05B.
W74-00793

WATER REUSE IN INDUSTRY, PART I — POWER GENERATION,

Sargent and Lundy, Chicago, Ill.

A. F. Aschoff.

Mechanical Engineering, Vol 95, No 4, p 21-25, April 1973. 9 fig.

Descriptors: *Water reuse, *Industrial water, *Powerplants, Cooling water, *Waste water treatment, Water pollution control, *Thermal pollution, Effluents, Water resources, Reverse osmosis, Ion exchange, Electrodialysis, Nuclear reactors, Waste water (Pollution), Nuclear wastes, Industrial wastes, Liquid wastes, Waste water treatment, Recycling.

By the year 2000, the U.S.A. will need over 1 trillion gal of water daily. With common sense and careful management, availability can be assured through steady attempts to close the loop by recycling or reuse in another function. The power industry, one of the largest industrial users of water, needs water mainly for condensation of exhaust steam from turbine generators, but also as a sluicing agent for disposal of bottom ash and flyash generated in coal-fired power boilers, for disposal of radioactive and other wastes from nuclear reactors, and as high-purity makeup water in the heat cycle of all types of power plants. Various modern technologies for treatment and reuse of polluted or thermally polluted waste waters in the power industry are discussed and illustrated, such as discharges from cooling lakes, wet and dry cooling towers, spray ponds, floating spray assemblies, ash basins, and boiling-water or pressurized-water reactors. Ion-exchange resins, electrodialysis, and reverse osmosis are examples of promising future water-treatment techniques. (See also W74-00795 thru W74-00798) (Brown-IPC)
W74-00794

WATER REUSE IN INDUSTRY, PART 2 -- TRANSPORT WATER,

Pavia-Byrne Engineering Corp., New Orleans, La. E. H. Pavia, and A. D. Tyagi.

Mechanical Engineering, Vol 95, No 5, p 32-34, May 1973. 4 fig.

Descriptors: *Industrial water, *Water reuse, *Waste water treatment, Fish handling facilities, Transportation, *Food processing industry, Water pollution sources, *Hydrogen sulfide, Toxicity, Water pollution control, Recycling, Sulfides, Emulsions, Oil, Oil-water interfaces, Sedimentation, Industrial wastes, Pilot plants, Biochemical oxygen demand, Chemical oxygen demand.

Identifiers: Fish oil, Fish meal, *Transport water, *Fish-processing industry, Materials handling, Desegregation, Dissolved gases.

In 1970 the U.S. produced 264,800 tons of fish meal and 96,850 tons of fish oil. The water used as transport medium in fish-reduction plants is highly contaminated and may exceed a five-day BOD of 40,000 and a COD of 400,000 mg/liter. Dissolved hydrogen sulfide poses a particular toxicity hazard. A water-recycling and pollution-control system developed at Zapata Protein Inc. is described. It was put into operation in August 1972 after pilot-scale testing. The installation is based on a degasification process which destroys the water-oil-dissolved gas emulsion, thus making the de-equilibrated components amenable to conventional separation by sedimentation. With steadily improved operation, the system permitted over 95% of water to be reused and its sulfide content to be held below 3 mg/liter. Further improvements are anticipated for the 1973 fishing season. (See also W74-00794) (Brown-IPC)
W74-00795

WATER REUSE IN INDUSTRY, PART 3 -- MINE WATER,

Environmental Protection Agency, Washington, D.C.

J. M. Shackelford.

Mechanical Engineering, Vol 95, No 6, p 32-34, June 1973.

Descriptors: *Mine water, *Acid mine water, *Water reuse, *Industrial water, *Waste water treatment, Government supports, Water pollution sources, Federal government, Neutralization, Dissolved solids, Sludge disposal, Iron compounds, Oxidation, Biological treatment, Electrochemistry, Reverse osmosis, Electrodialysis, Ozone, Freezing, Freeze drying, Foam fractionation, Distillation, Ion exchange, Lime, Limestones, Research and development.

Identifiers: *Neutralosis, Federal research.

Billions of gallons of polluted water are involuntarily released by the mining and mineral-extraction industries. The conversion and recycling of this drainage water have been the objects of a four-year-old EPA research program which has already yielded promising results, particularly for solving acid mine and drainage problems caused by ferrous and ferric sulfates and sulfuric acid from the oxidation of pyritic ores. The old technique of lime neutralization does not effectively remove total dissolved sulfur, generates a large amount of sludge, and requires large land impoundment areas. Limestone in lieu of lime has several advantages, but cannot precipitate ferrous hydroxide. Biological and electrochemical iron-oxidation methods and naturally generated ozone treatments are being researched, along with a two-stage limestone-lime treatment. Other project under study include reverse osmosis, neutralosis (a combination of neutralization and reverse osmosis), freezing, electrodialysis, foam fractionation, distillation, and ion-exchange processes. (See also W74-00794) (Brown-IPC)
W74-00796

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

WATER REUSE IN INDUSTRY, PART 4 -- METAL FINISHING,
Avco Corp., Wilmington, Mass. Avco Space Systems Div.
R. J. Campbell, and D. K. Emmerman.
Mechanical Engineering, Vol 95, No 7, p 29-32, July 1973. 2 fig, 2 tab.

Descriptors: *Industrial water, *Water reuse, *Desalination processes, *Freezing, *Freeze drying, Metallurgy, *Waste water treatment, Water pollution sources, Pollution abatement, Water pollution treatment, Heavy metals, Metals, Temperature, Dissolved solids, Energy, Costs, Operating cost, Demineralization.

Identifiers: *Metal finishing industry, Chemical recovery.

The technique of seawater desalination by freezing is eminently applicable to the treatment and recycling of metal-plating waste waters to minimize the discharge of heavy metals and dissolved solids. Its main advantages include low-temperature operation, low energy requirements, avoidance of membranes and other surfaces, and no volatiles carryover. A schematic description of the freeze-concentration and recovery process is presented, and its operating parameters and economic aspects are discussed. (See also W74-00794) (Brown-IPC)
W74-00797

WATER REUSE IN INDUSTRY, PART 5 -- THE WATER POLLUTION CONTROL ACT: REACHING TOWARD ZERO DISCHARGE,
Polytechnic Inst. of Brooklyn, N.Y.
D. F. Othmer.
Mechanical Engineering, Vol 95, No 9, p 32-37, September 1973. 1 fig.

Descriptors: *Discharge (Water), *Water reuse, *Water pollution treatment, *Waste water treatment, *Industrial wastes, *Pollution abatement, Legislation, Research and Development, Economic feasibility, United States, Aquatic bacteria, Dissolved oxygen, Biochemical oxygen demand, Oxidation, Oxygenation, Recycling, Coagulation, Flocculation, Sedimentation, Biological treatment, Color, Phosphates, Enzymes, Activated sludge, Activated carbon, Chlorination.

The mandate given by Congress to the EPA under the Water Pollution Control Act envisions a goal of zero-pollution discharge into rivers within the next twelve years, beginning with immediate application of the best practical control technology available. Developing appropriate methods and standards will strain both the ingenuity of engineers and the pocketbook of industries. Nevertheless, in view of the dangers of continuing present levels of allowable pollution (such as bacterial hazards and oxygen depletion), the ancient philosophy of waste disposal by dilution must give way to optimized primary, secondary, and tertiary treatments for maximum product recovery and water recycling. Promising approaches to this direction are discussed, including clarification by coagulation, flocculation, and sedimentation of solids; activated sludge and other biochemical treatments; wet combustion and chemical oxidation, including oxygen- or enzyme-aided oxidations; and removal of phosphates, coloring matter, and other specific pollutants from municipal and industrial wastes by activated carbon adsorption, chlorination, and the like. (See also W74-00794) (Brown-IPC)
W74-00798

WATER SUPPLY AND WASTE DISPOSAL POLICY REVIEW.
Indian Nations Council of Governments, Tulsa, Okla.

Working Paper IWS-6, March, 1970. 31 p, 13 ref. HUD Oklahoma P-117.

Descriptors: *Water resources development, *Federal project policy, *Regional development, *Water policy, Water supply, Waste water disposal, Oklahoma, Cost sharing, Projects, Cost allocation, State governments, Administrative agencies, Interstate compacts.

A review of federal, state, and local policy for water supply and waste disposal is presented. It is noted that the federal government only recently became active in the environmental issues of sanitation. Although much legislation has been passed, especially for grant programs, this legislation has had several shortcomings. For example, money authorized to be spent is not always appropriated by Congress. Secondly, the programs often require state and local governments to contribute to the funding; these government units often are already had pressed financially. The State of Oklahoma has set up what seems to be an adequate framework for water supply and waste disposal projects. The State has entered into interstate agreements for water resources development. It has also established departments to guide future water resources development within the State. Regionalization of plans is stressed, as it is on the federal level. Regional plans can include water supply and waste disposal, as well as flood control, stream regulation, land reclamation, and other water resources related projects. Funding, however, appears to be inadequate on the State level. (Poertner)
W74-00809

REMOVAL OF AMMONIA NITROGEN BY BREAKPOINT CHLORINATION USING AN ACTIVATED CARBON CATALYST,
New York State Dept. of Environmental Conservation, Albany.
W. N. Stasiuk, L. J. Hetling, and W. W. Shuster.
Technical Paper, No 26, April, 1973. 31 p, 7 fig, 1 tab, 1 appendix.

Descriptors: *Waste water treatment, *Nitrogen, *Ammonia, *Chlorination, Activated carbon, Laboratory tests, Water pollution, Water pollution control, Municipal wastes, Industrial wastes, Nitrogen compounds.

Identifiers: *Breakpoint chlorination.

The fate of ammonia nitrogen when chloramines were reacted with activated carbon was investigated in a laboratory study. Activated carbon catalyzed chloramine decomposition reactions and, depending on the pH and the ratio of chlorine to ammonia, 100 percent of the ammonia nitrogen could be removed at a chlorine-to-ammonia molar ratio slightly greater than 1.5. An end product of the reaction was found to be trace amount of nitrate, with nitrate increasing with an increased pH. The use of activated carbon by adsorption of chloramines was studied as an alternative to other methods of ammonia nitrogen removal. Removal of ammonia nitrogen is desirable as nitrogen can be the influencing factor on algae growth, and it has a direct oxygen demand. The alternative methods of nitrogen removal include: (1) biological nitrification-denitrification, (2) selective ion exchange, (3) air stripping at elevated pH, and (4) breakpoint chlorination. This report describes the results of the breakpoint chlorination method using an activated carbon catalyst. (Poertner)
W74-00810

A GUIDE TO CHEMICAL AND CLARIFIER SELECTION FOR WASTE WATER TREATMENT,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and L. J. Hetling.
Technical Paper No. 29, April, 1973. 12 p, 2 tab, 31 ref.

Descriptors: *Waste water treatment, *Reviews, *Sewage treatment, *Chemical precipitation, Documentation, Publications, Coagulation,

Phosphorus, Treatment, Industrial wastes, Municipal wastes, Effluents.
Identifiers: *Chemical treatment, *Clarifiers, Phosphorus removal.

The increasing need for higher quality wastewater treatment and phosphorus removal has led to the consideration of chemical coagulation. Some of the coagulants that can be used include lime, alum, iron salts, and organic polymers. Many studies have been carried out on the use of each of these in individual situations. Although individual conditions will govern the use of a particular chemical, this publication is intended to serve as a guide in narrowing the available coagulants for final choice. Often the optimum chemical dosage for coagulation of sewage colloids is not the same as the optimum dosage for phosphorus removal; although the practical purposes the dosages are frequently in the same range. For example, suspended solids coagulation increases with increased lime dosage, and phosphorus removal is independent of dosages. An influent phosphorus content of 15 mg/l or 5 mg/l can both be reduced to 1 mg/l by the same lime dosage. For iron and aluminum salts, however, a ratio of 1:1 or 2:1, metal to P-mole ratio, is best. Increases beyond this level are often better for coagulation, although higher dosages can increase turbidity and colloidal solids. Other factors needing consideration are the point of chemical addition, design of clarifiers, effect of the chemicals on the handling of sludge, and effect of sludge on land. (Poertner)
W74-00811

PHASE I COMPREHENSIVE WATER AND SEWER PLAN.
Mid-Missouri Regional Planning Commission, Jefferson City.
For primary bibliographic entry see Field 06A.
W74-00813

ENHANCING TRICKLING FILTER PLANT PERFORMANCE BY CHEMICAL PRECIPITATION,
Richardson, Tex.

R. E. Derrington, D. H. Stevens, and J. E. Laughlin.

Copy available from GPO Sup Doc as EP1.23:670-73-060, \$1.45; microfiche from NTIS as PB-224 929/0, \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-060, August 1973. 117 p, 45 fig, 6 tab, 10 ref. Grant No S800685. EPA Project 11010 EGL.

Descriptors: Biological treatment, *Chemical precipitation, Oxygen demand, *Phosphorus, Suspended solids, *Tertiary treatment, *Trickling filters, *Waste water treatment, Activated carbon, Biochemical oxygen demand, Chemical oxygen demand, Coagulation, Colloids, Data processing, Dispersion, Diurnal distribution, Domestic wastes, Feeding rates, *Filtration, Flocculation, Laboratory tests, Nutrient removal, Sedimentation, Sewage treatment, Sludge disposal, *Texas, Tracers, Treatment facilities.
Identifiers: *Richardson (Texas).

Two years of plant scale studies indicated metal addition was an effective effluent polishing technique at this conventional wastewater treatment plant. Effluent phosphorus (P), five-day BOD and suspended solids were reduced to 0.5, 5, and 7 microgram/l respectively. Aluminum sulfate was more effective than ferric chloride. Alum addition ahead of the final clarifier proved the best arrangement. An optimum mole ratio (metal/phosphorus) of 1.6 developed; this ratio shows moles of aluminum fed per mole of incoming total phosphorus. Chemical costs, of which one-third was for transportation, were 5 cents per 1,000 gallons of flow treated, or 36 cents per pound of phosphorus removed when in the 96 percent reduction range. Chemical addition doubled the volume of digested sludge but dewatering on

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sand beds took half as long as previous conventional operations. During this demonstration the treatment system received some 1.6 mgd of typical domestic discharge, essentially its design loading. Hydraulic loading on clarifiers was minimized by drastic reduction of recirculation flows. (EPA) W74-00835

ALUM ADDITION TO ACTIVATED SLUDGE WITH TERTIARY SOLIDS REMOVAL, District of Columbia Dept. of Environmental Services, Washington.

A. B. Hais, J. B. Stemberg, and D. F. Bishop.
Copy available from GPO Sup Doc as EPI-23:670-73-037, \$0.65; microfiche from NTIS as PB-225 028/0, \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-037, August 1973. 25 p, 7 fig, 5 tab, 8 ref. EPA Project 11010 EYM. Contract 14-12-818.

Descriptors: *District of Columbia, Pilot plants, *Aeration, Hydrogen ion concentration, *Waste water treatment, *Activated sludge, Biochemical oxygen demand, *Filtration, Sludge treatment, Suspended solids, Chemical precipitation, Phosphates, Filters.

Identifiers: Aluminum phosphate precipitation, *Alum addition, Step aeration, Multi-media filters.

The activated sludge system was operated with 4.0 hours aeration time (based on the influent flow) and an overflow rate in the secondary settler of 425 gal./day (sq. ft.). Alum was dosed assuming an influent phosphorus concentration of 8.15 mg/l as P. Lime (25 mg/l) was added to the mixed liquor to stabilize the wastewater during periods of low alkalinity. The dual-media filter (24-inch bed depth) and the tri-media filter (40-inch bed depth), each loaded with secondary effluent at 2.4 gal./min. (sq. ft.), regularly exhibited filter runs between 24 and 32 hours. When operating the step aeration with the usual final stage mixed liquor pH (6.7-6.9), the complete system with tri-media filtration removed 92% of the suspended solids, 96% of the BOD and 93% of the phosphorus from the primary effluent. Daily fluctuations in the final pass pH, however, corresponded to similar fluctuations in phosphorus removal. Furthermore, the removal of suspended solids, BOD and phosphorus all increased to 97% during those periods when the final pass pH was between 6.3 and 6.6. Operation at pH below 6.2 caused an upset in the activated sludge. (EPA) W74-00837

RESTORE RURAL WATER AND WASTE DISPOSAL GRANT PROGRAMS.

For primary bibliographic entry see Field 05G.

W74-00875

PROCESS FOR TREATING WASTE WATER CONTAINING NITRILES,

Sumitomo Shipbuilding and Machinery Co., Ltd., Tokyo (Japan). (Assignee)

Y. Fujii, and T. Oshimi.
U.S. Patent No. 3,756,947, 4 p, 3 tab, 1 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 281, September 4, 1973.

Descriptors: *Patents, *Activated sludge, *Waste water treatment, Water purification, Microorganisms, Bacteria.

Identifiers: *Cyanide, *Nitriles, *Achromobacter nitriloclastes, *Alcaligenes viscolactis.

At least one microorganism capable of degrading nitriles and cyanides, selected from the genera *Alcaligenes* and *Achromobacter* is added to an activated sludge to acclimate the microorganisms to the sludge. The waste water containing nitriles and cyanides is passed through the activated sludge containing the acclimated microorganisms to purify the waste water. Two particularly useful strains *Alcaligenes viscolactis* S-2 ATCC (FERM-P No

759) and *Achromobacter nitriloclastes* S-10 ATCC 21697 (FERM-P No 760) were isolated. Diagnostic characteristics of the microorganisms are tabulated. Test information is included. (Sinha-OEIS) W74-00957

METHOD OF PURIFYING SEWAGE EFFLUENT AND APPARATUS THEREFOR,

B. Greenberg.
U.S. Patent No. 3,756,933, 7 p, 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 278, September 4, 1973.

Descriptors: *Patents, *Industrial wastes, *Sewage treatment, *Water purification, *Waste water treatment, Polyelectrolytes, Metals, Phosphorus, Nitrogen, Carbon, Aluminum, Calcium, Magnesium, Chlorides.
Identifiers: *Electrolytic treatment.

Sewage or industrial wastes are electrolytically treated by circulating the liquid past the cathode and upward with the cathode evolved hydrogen to raise the pH of the circulating liquid and precipitate, flocculate and float the alkaline earth products. The floated materials are separated from the liquid, and the liquid so depleted then flows downward, and any unfloatable material is returned to the cathode upward liquid flow, and at least part of the liquid is withdrawn from the lower part of the downward flow. It is then exposed to the oxygen and chlorine bubbles evolved at the anode. Wastes treated refer particularly to organic materials which are anionic polyelectrolytes and their precursors, including compounds of phosphorus, nitrogen, carbon or other elements, and a dissolved polyvalent metal such as aluminum, calcium, or magnesium and chloride ions. (Sinha-OEIS) W74-00958

SEWAGE TREATMENT PROCESS,

Biospherics, Inc., Rockville, Md. (assignee)
G. V. Levin, and G. J. Topol.

U.S. Patent No. 3,756,946, 2 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 280, September 4, 1973.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, *Aeration, Biological Oxygen demand, Phosphates, Microorganisms, Anaerobic conditions, *Waste water treatment.

Sewage is mixed with activated sludge. The mixture is passed to an aeration zone where the BOD content is reduced and microorganisms take up phosphate. The product is then passed to a settling zone containing an anaerobic layer of sludge. In this zone phosphate-enriched sludge settles into the anaerobic lay of sludge and a substantially phosphate-free effluent is removed from above the layer of sludge. The sludge is maintained under anaerobic conditions in the sludge layer of the settling zone for a time sufficient to cause the organisms in the sludge to release phosphate to the liquid phase of the sludge. Sludge containing soluble phosphate is removed from the settling zone. The sludge is then treated to separate a phosphate-enriched aqueous phase and to provide sludge having a higher concentration of solids and a lesser concentration of phosphate. This sludge is recycled for mixing with influent sewage material. (Sinha-OEIS) W74-00960

SEWAGE DISPOSAL EFFLUENT PURIFIER,

Moody Aquamatic Systems, Inc., Meadville, Pa. (assignee)

D. L. Moody, and V. R. Troglione.
U.S. Patent No. 3,756,410, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 154, September 4, 1973.

Descriptors: *Patents, *Liquid wastes, *Sewage treatment, *Water purification, *Waste water treatment.

Liquid sewage is fed to a contact tank where it passes through a porous filter that removes any remaining solids. Ozone gas is bubbled through it to oxidize the impurities and remove objectionable odors. An ozone gas diffuser is mounted in the tank beneath the filter so that excess ozone will pass upward through the filter to keep it purified. (Sinha-OEIS) W74-00962

SYSTEM FOR ELIMINATING ENVIRONMENTAL POLLUTION,

H. E. DeBord.
U.S. Patent No. 3,756,171, 4 p, 6 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 94, September 4, 1973.

Descriptors: *Patents, *Incineration, Solid wastes, *Waste treatment, *Filtration, *Municipal water.

A system for the disposing of rubbish without polluting the environment includes an incinerator for initially burning the rubbish; this incinerator includes a water bath for catching and cooling the noncombustibles therein. A conveyor belt conveys the noncombustible material from the furnace for refining and reuse. A blower takes a suction on the smoke in the fire box of the incinerator and draws it through a compression box where it is scrubbed with water, filtered and then deposited in a final bath tank. The water in the bath tank is subsequently purified in a filter box, and is then deposited directly into the municipal drain system. (Sinha-OEIS) W74-00964

METHOD FOR BIOCHEMICAL TREATMENT OF INDUSTRIAL WASTE WATER,

S. V. Yakovlev, J. V. Voronov, V. N. Korenfov, A. B. Nevsky, and V. A. Dobrikova.

U.S. Patent No. 3,755,156, 6 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1252, August 28, 1973.

Descriptors: *Patents, *Industrial wastes, *Municipal wastes, *Waste water treatment, Metals, Chromium, Chlorine, Activated sludge, *Oxidation, Chemical reaction, Biochemical Oxygen Demand.

Industrial waste water which contains combined oxygen in the form of inorganic compounds of hexavalent chromium, chlorine or mixtures thereof, is mixed with municipal sewage containing organic matter. The mixture is subjected to mechanical purification. The mixture is then fed to an un aerated tank to effect simultaneous biochemical reduction of the inorganic oxygen-containing compounds by the activated sludge and biochemical oxidation of the organic matter. The mixture is then fed to the settler, while the precipitated activated sludge is returned to the un aerated tank. (Sinha-OEIS) W74-00966

PROCESS FOR TREATING INDUSTRIAL WASTES,

S. Bastacky.
U.S. Patent No. 3,755,102, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1240, August 28, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Acids, Evaporation, *Electrolysis, Evaporation.

Identifiers: *Sulphuric acid, Spent pickle liquor.

A process is presented for treating spent sulphuric acid industrial wastes by a combination of

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evaporation and electrolysis. The wastes are treated in cells having several alternately positioned positive and negative aluminum electrodes. The electrodes can be plate form, corrugated sheet form, pipe form or a combination of these. Direct current is applied and the polarity of the electrodes can be changed to preserve the electrodes. A solid residue forms which can be further reduced by an ignition step and the metal removed by cleaning or pickling can be reclaimed. (Sinha-OEIS)
W74-00967

INERT GAS STRIPPING OF CONTAMINATED WATER,

Texaco, Inc., New York. (assignee)

R. D. Kent.

U.S. Patent No. 3,754,376, 3 p, 2 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1069, August 28, 1973.

Descriptors: *Patents, *Waste water treatment, Ammonia, Carbon dioxide, Hydrogen sulfide, *Gases, Water pollution.

Identifiers: *Stripping process.

Water containing contaminating gases such as hydrogen sulfide, carbon dioxide and ammonia is freed of these contaminants by a closed system stripping process which employs an inert gas and steam. At a given temperature ammonia, carbon dioxide and hydrogen sulfide will be efficiently stripped if some inert gas is present. Solids will have less tendency to form since the equilibrium between solid such as ammonium bisulfide and ammonium carbonate, for instance, will be more in favor of the gases making up the solids. The mixture of inert gas stripped gases is passed through absorbing means to separate the inert gas from the stripped gas. The inert gas is then recycled by means of a compressor to be reused for stripping purposes. (Sinha-OEIS)
W74-00969

STORM DRAINAGE STUDY, (CHATHAM COUNTY-SAVANNAH, GEORGIA).

Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

For primary bibliographic entry see Field 04A.

W74-01031

WATER AND SEWER SERVICE NEEDS OF LOW AND MODERATE INCOME HOUSEHOLDS IN METROPOLITAN WASHINGTON.

Metropolitan Washington Council of Governments, D.C.

Available from the National Technical Information Service as PB-217 529, \$3.00 in paper copy, \$1.45 in microfiche. Housing Information Report No. 2. Final Report. December, 1972. 70 p, 3 append.

Descriptors: *Planning, *Coordination, *Plumbing, Administration, Institutional constraints, Financing, Costs, Water allocation (Policy), Domestic wastes, Water demand, *District of Columbia.

Identifiers: Service coordination and delivery, Plumbing needs, Planning strategy, *Washington, D.C.

Over 16,000 households in the Washington Metropolitan Area do not have access to adequate water and sewer service because of a lack of complete plumbing facilities. The task of alleviating this problem is hindered by three major difficulties: (1) there is a conflict between development policies aimed at planning the orderly growth of the metropolitan area and the provision of necessary services to low income residents living in rural or low density areas; (2) there are high costs to both residents without services and the local jurisdiction or agency empowered with

authorizing water and sewer service; (3) federal, state, and local funding is often inadequate and definitions of program eligibility are narrow. Current federal, state, and local programs are analyzed. Development of a program strategy is primarily dependent on coordination of information, of development goals with human resource goals, and coordination and expansion of federal, state, and local programs. Contained in the appendices are data on the water and sewer problem, a schedule of connection and plumbing installation costs, and examples of local assistance programs. (Hoffman-North Carolina)
W74-01034

ENVIRONMENTAL IMPACT STUDY FOR EXPANSION ON THE VILLAGE CREEK SEWAGE TREATMENT PLANT,

Advanced Technology Center, Inc., Dallas, Tex.

E. M. Wilkins, D. H. Petersen, and J. D. Suggs. Available from the National Technical Information Service as PB-220 024, \$4.25 in paper copy, \$1.45 in microfiche. Prepared for Department of City Planning, Arlington, Texas. September, 1972. 41 p, 6 fig, 6 ref, 3 append. HUD CPA-TX-06-16-1046.

Descriptors: *Odor, *Path of pollutants, *Dispersion, Effluents, Methodology, *Texas, *Air pollution.

Identifiers: *Climatic effects, *Temperature inversion, Temperature lapse conditions, Odor concentration, Arlington (Tex), Trinity River basin (Tex).

Temperature lapse conditions (Type B) and temperature inversion conditions (Type E) were chosen as representative of the two major types of diffusion regimes. Winds follow the Trinity River basin during inversion conditions, affecting the city of Arlington 22% of the time annually. Wind directions are not stable during non-inversion conditions, although the effect on the city would total 20% annually. Sewage treatment plant expansion would have little effect on calculated odor concentration isopleth patterns; the important difference would be the increase in the emission rate. The 'effective source strength' concept was utilized for analysis. The threshold odor concentration at a known downward distance from the source was observed, with the magnitude of the source required to account for the observed concentration computed using diffusion theory. Under Type B conditions, the expanded plant emission rate was calculated as 1.87×10^8 odor units/second. Under Type E conditions, the rate of vertical mixing of the effluent with the air stream is very slow, and therefore less conducive to long-distance transport of odorous gases than the temperature lapse condition. However, this could also result in a temporary 'fumigation' downwind once the inversion condition ceased besides possible oxygen starvation in the stagnation area. The new emission rate would be 1.47×10^6 odor units/second. Generally, odor concentrations would be increased by as much as a factor of five. The amount of inhabited area covered by above threshold conditions would be increased by more than a factor of 8. Tables detail the exact figures for both Type B and Type E conditions. (Hoffman-North Carolina)
W74-01035

WATER AND SEWER PLAN UPDATE, (GRAY, GEORGIA).

Middle Georgia Area Planning Commission, Macon.

Available from the National Technical Information Service as PB-219 464, \$3.50 in paper copy, \$1.45 in microfiche. Report No. MG APC-72-8. April 1973. 19 p, 2 maps, 4 tab. CPA-GA-04-04-1001.

Descriptors: *Water supply, *Sewerage, Costs, Planning, *Georgia.

Identifiers: Water system expansion, *Sewer system expansion, *Gray (Ga.).

A status evaluation is presented of the 11 uncompleted water and sewer programs which have been approved by the Middle Georgia Area Planning Commission through the A-95 review process. Each program is described, with total cost and proposed methods of financing included. Four projects—Gray, Forsyth, Jeffersonville and Perry—are proceeding with final construction plans. Factors that have prohibited development of other projects are: (1) freeze on water and sewer financial assistance programs and (2) prior to the freeze lack of grant money in federal water and sewer assistance programs. Proposed methods for financing the uncompleted projects are given. The improvement program for the city of Gray, which includes additions to both the water system and the sewer system, is summarized. Two additional wells will supplement the present water supply. The water treatment capacity is to be doubled, and a ground storage reservoir will be constructed. Tables detail costs. (Hoffman-North Carolina)
W74-01036

A SUMMARY REPORT MASTER WATER AND SEWERAGE PLAN.

CIM, Inc., San Luis Obispo, Calif.

Prepared for San Luis Obispo County, Calif. December, 1972. 34 p, 5 tab, 8 maps.

Descriptors: *Water supply development, *Sewerage, *California, Desalination processes, Groundwater, Planning, Costs, Networks, Coordination, Water reuse, Treatment facilities.

Identifiers: *San Luis Obispo County (Calif.), Water system expansion, Sewerage system expansion, *Nacimiento Dam (Calif.).

The objective was to prepare a county-wide plan of coordinated expansion of water and sewerage systems. The extensive size of the county and the presence of major mountain ranges within the county precluded any single generalized approach. Economic evaluations compared capital requirements for alternate water supply and sewerage facilities. For water supply facilities, a factor for comparison of the net cost per unit of water delivered to users in each specific service area was used to determine equivalent unit water costs. Development of water from Nacimiento Reservoir and from the State Water Project was deemed the most feasible combination for water supply sources. Scheduling, size, capacity, and construction costs for proposed facilities are included. The comprehensive sewerage plan emphasizes the need for elimination of ocean discharge of treated effluent from existing wastewater treatment plants in favor of a wastewater reclamation program. Specific recommendations for the individual service areas are included. (Hoffman-North Carolina)
W74-01041

SEWERAGE MASTER PLAN, EUGENE-SPRINGFIELD URBANIZING AREA.

Edmundson, Kochendoerfer, and Kennedy, Portland, Ore.; and Daniel, Mann, Johnson, and Mendenhall, Portland, Ore.

Prepared for Lane Council of Governments, Eugene, Oregon. 1970. 164 p, 57 fig, 52 tab, 25 ref, 6 append. ORE.P-116.

Descriptors: *Sewerage, *Planning, *Oregon, *Urban hydrology, Water quality control, Projects, Costs, Coordination, Urbanization. Identifiers: *Sewerage system expansion, Eugene (Ore), Springfield (Ore).

To define the need for new sewerage facilities, estimates of sewerage flows and characteristics were made. High infiltration not only complicated

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flow projections but were the source of present, and possibly future, excessive flows. Due to anticipated increased water quality standards by 1990, plants were designed to provide secondary treatment of all wastes with BOD and SS removals over 95% by 1990. The study area was divided into 2 parts: the central study area of 160 square miles, including Springfield and Eugene; and subareas consisting of the 7 outlying communities. Because of the distance from the present urbanized area and small populations, the outlying communities were not included in central sewerage system short-term plans but were considered separately. The recommended plan included: a single regional sewerage treatment plant to ultimately serve the entire study area; a system of interceptor sewers; and pumping stations as required for lifting the sewerage for delivery to the regional treatment plant via the trunk system. A major sewer cleaning, inspection, and sealing program, preceded by a project to review present sealing techniques, was recommended. Prevailing construction costs were used to compare alternative projects on a first and annual cost basis. (Hoffman-North Carolina)
W74-01042

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE-1970.
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
For primary bibliographic entry see Field 06B.
W74-01045

AREAWIDE WATER AND WASTE WATER PLANNING STUDY FOR THE ST. CHARLES MESA, RYE-COLORADO CITY, AND BEULAH SECTORS OF PUEBLO COUNTY.
Sellards and Grigg, Inc., Lakewood, Colo.

Prepared for the Pueblo Regional Planning Commission, Pueblo, Colorado. March, 1973. 110 p, 27 fig, 27 tab, 15 ref, 2 append.

Descriptors: *Water supply, *Sewerage, *Planning, *Water quality control, Land use, Water demand, Water quality standards, Water sources, Water rights, Design criteria, Costs, *Urbanization, Treatment facilities, Projections, Colorado.

Identifiers: Joint facilities, Pueblo County (Colo), St. Charles Mesa (Colo.), Rye-Colorado City (Colo.).

An engineering-oriented water supply and waste-water disposal study is described for three planning areas in Pueblo County. The plans are closely related to the comprehensive land use planning for the County and are based largely on future urban growth and demands, engineering criteria, and water quality standards and requirements. Each of the three planning areas is treated separately with the analyses including (1) discussions of the existing water and sewer systems in terms of water demand, water rights, water storage, water distribution, sewage treatment and disposal, and adequacy of receiving streams to accept wastes; (2) investigations of the possibilities of joint and/or multiple use of system facilities; and (3) recommendations for specific facilities and programs for both the short term (1978) and the long term (1993). The need for flexibility over the long term to meet changing standards and technology is emphasized. Some of the considerations and criteria used in the analyses include population projections, land use plans, water demands, stream flows, water quality standards, water rights, and past system performances. Water supply sources include shallow wells, deep wells, and diversions from rivers. Two possible waste disposal alternatives are land disposal and temporary retention of effluent during low flow periods. (Ellfers-North Carolina)
W74-01047

COMPLEMENTARY ROLE OF IRON (III), SULFATE AND CALCIUM IN PRECIPITATION OF PHOSPHATE FROM SOLUTION,
Rutgers - The State Univ., New Brunswick, N.J.
Dept. of Soils and Crops.
P. H. Hsu.

Environmental Letters, Vol 5, No 2, p 115-136, 1973. OWRR A-031-NJ (2).

Descriptors: *Phosphate, *Nutrient removal, Chemical precipitation, *Iron compounds, *Calcium compounds, *Sulfates, *Waste water treatment.

The purpose of this research is to find more economical and reliable ways of eliminating phosphate from waste water by means of compounds of iron. The effectiveness of iron (III) to precipitate phosphate varied greatly with the P/Fe ratios present. For a given P/Fe ratio, effective precipitation was observed only in a certain range of OH/Fe ratios. The solution acidity corresponding to the optimum OH/Fe ratio varied from nearly neutral with P/Fe mole ratio \pm 0.2 to pH 2.6 - 2.9 with P/Fe mole ratio \pm 2. The effectiveness of phosphate precipitation was greatly improved on the acidic side of the optimum region by the addition of SO₄ \pm and the alkaline side by addition of Ca²⁺. When both SO₄ \pm and Ca²⁺ were present, phosphate was effectively precipitated through/fe ratios investigated, corresponding to a pH range of 2.6 to 8. Also, with low P/Fe ratio in preparation, the residual phosphate concentration was low but the amount of phosphate precipitated per mole of iron (III) was also low. With high P/Fe ratio in preparation, nearly one mole of phosphate was removed per mole of iron (III), but a considerable amount of phosphate remained in solution.
W74-01053

EFFECT OF DETERGENT APPLICATION ON THE GROWTH OF CORN,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Agronomy.
For primary bibliographic entry see Field 03C.
W74-01057

5E. Ultimate Disposal of Wastes

PERMEABILITY RESTORATION IN UNDERGROUND DISPOSAL RESERVOIRS,
Alabama Univ., University Natural Resources Center.

D. M. Grubbs, C. D. Haynes, and G. P. Whittle.
Available from the National Technical Information Service as PB-224 915/9, \$9.25 in paper copy, \$1.45 in microfiche. Report 733, September 1973. 138 p, 27 fig, 8 tab, 16 ref, 2 append. OWRR A-032-ALA (1).

Descriptors: *Waste disposal wells, *Permeability, *Industrial wastes, *Underground storage, Underground waste disposal, Boreholes.
Identifiers: *Pre-injection treatment, Borehole reaming.

Conclusions on permeability restoration include: The injection of reactive liquid wastes into underground disposal reservoirs will impair permeability as a result of the interaction of waste liquids and the rock matrix and pore materials. The decline in permeability will generally stabilize and maintain an asymptotic relationship to the low value reached. Permeability and hence the capacity of a reservoir to accept wastes without resorting to excessive input pressures can be improved by one or more of several restoration techniques. Reaming of the face of the borehole generally an effective means of permeability restoration. Chemical treatment by injection of acids (such as dilute hydrochloric) is effective in restoring permeability in sandstone reservoirs. Underreaming of the borehole in the laboratory investigation was effective in the restoration of permeability in

carbonates much the same as the improvement in permeability in sandstone reservoirs. In designing liquid waste disposal systems, laboratory studies employing reservoir rock specimens and samples of the waste to be injected may lead to the selection of appropriate and effective procedures for permeability restoration. The capacity of the reservoir to accept a given volume of waste within the design criteria for pressure requirements should then contribute to the economic feasibility of this method of waste disposal. A broader use of underground waste disposal will complement the national effort to rid surface streams of their role as carriers of noxious wastes.
W74-00554

SPRAY DISPOSAL OF SEWAGE EFFLUENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W74-00572

PROBLEM DEFINITION STUDY: EVALUATION OF HEALTH AND HYGIENE EFFECTS OF THE DISPOSAL OF PESTICIDES AND PESTICIDE CONTAINERS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05G.
W74-00580

SUMMARY REPORT: PILOT PLANT STUDIES ON DEWATERING PRIMARY DIGESTED SLUDGE,
Los Angeles County Sanitation District, Calif.
For primary bibliographic entry see Field 05D.
W74-00700

SOLID WASTE MANAGEMENT PLAN, COWLITZ AND WAHKIAKUM REGION,
Cowitz, Wahkiakum Regional Planning Commission, Kelso, Wash.
For primary bibliographic entry see Field 05D.
W74-00747

BLEACHING EFFLUENT FOR IRRIGATION,
Stephen F. Austin State Coll., Nacogdoches, Tex.
For primary bibliographic entry see Field 05D.
W74-00787

OCEAN WASTE DISPOSAL IN SELECTED GEOGRAPHIC AREAS.
Interstate Electronics Corp., Anaheim, Calif.
Oceans Div.

Available from the National Technical Information Service as PB-224 793, \$8.00 in paper copy, \$1.45 in microfiche. Interim Report 4460C 1541, July 1973. 394 p, 29 fig, 31 tab, 129 ref. EPA Contract 68-01-0796.

Descriptors: *Waste disposal, Coasts, Sites, Outlets, Management, Harbors, Municipal wastes, Oceans.

Identifiers: *Ocean waste disposal, *Coastal zone management, Dredge spoil disposal, Hazardous materials.

Results are presented of an intensive face finding survey of ocean waste disposal practices in six geographic areas. The areas were the New York Bight; Charleston, South Carolina; segments of the Gulf of Mexico Coast; Southern California; San Francisco; and Puget Sound. Ocean disposal sites within these areas were selected to provide a representative cross section of ocean waste disposal practices in the United States. Current with a field survey and personal interview program, detailed data and information research was performed. The information obtained by this coordinated program was used to establish a data base,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

which will be used to recommend guidelines for the control of ocean waste disposal. (EPA)
W74-00928

WATER DISPOSAL CAISSON AND METHOD OF USING SAME,
For primary bibliographic entry see Field 05G.
W74-00963

5F. Water Treatment and Quality Alteration

WATER SUPPLY AND WASTE DISPOSAL POLICY REVIEW.
Indian Nations Council of Governments, Tulsa, Okla.
For primary bibliographic entry see Field 05D.
W74-00809

PHASE I COMPREHENSIVE WATER AND SEWER PLAN.
Mid-Missouri Regional Planning Commission, Jefferson City.
For primary bibliographic entry see Field 06A.
W74-00813

TRENDS IN DEVELOPMENT OF WATER TREATMENT FOR POPULATED REGIONS (TENDENTSII RAZVITIYA OBRABOTKI VODY DLYA NASELENNYKH MEST),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
L. N. Fal'kovskaya.
Vodnyye Resursy, No 1, p 55-64, 1973. 2 tab, 35 ref.

Descriptors: *Water treatment, *Water purification, *Water quality, *Potable water, *Public health, Odor, Taste, Coagulation, Filtration, Disinfection, Fluoridation, Municipal water, Construction costs.
Identifiers: *USSR.

The effects of potable-water quality on the health of a community are examined. Principal methods of water purification (chemical coagulation, filtration, disinfection, taste and odor control) and ways of increasing operational efficiency of purification facilities are described, and basic trends in scientific investigations on development of municipal water supplies are outlined. (Josefson-USGS)
W74-00841

A BILL TO BE KNOWN AS THE 'SAFE DRINKING WATER ACT OF 1973'.

Senate Bill 433, 93rd Cong, 1st Sess (1973), 35 p.

Descriptors: *Potable water, *Public health, *Water purification, *Water quality standards, *United States, Legislation, Water pollution treatment, Odor, Pollutants, Organic wastes, Governmental interrelations, Planning, Government finance, Research and Development.
Identifiers: *Hazardous substance, *Safe Drinking Water Act of 1973, Administrative regulation.

Increasing quantities and types of chemicals, bacteria, toxic metals, and other contaminants are entering the public water systems that serve as sources which supply the American people with water for drinking. Many of these contaminants are either not detected or are not removed by established water testing and treatment methods and they are thus consumed by or come in contact with the public, thereby presenting hazards to the public health. The federal government has the responsibility of establishing minimum national drinking water standards for all public water systems. The Administrator of the Environmental

Protection Agency (Administrator) is charged with formulating and issuing such standards which shall prescribe the maximum permissible levels of any contaminants. States are given the primary enforcement responsibility for the standards, but if the Administrator finds any state failing to comply with the prescribed standards, he may request the Attorney General to take action against the state. There is established in the Environmental Protection Agency a National Drinking Water Council which shall make recommendations to the Administrator on matters relating to drinking water standards. The Administrator is authorized to make grants to the states to assist them in establishing and maintaining adequate programs to assure the safety of public drinking water. (McKnight-Florida)
W74-00856

REDUCTION OF HIGH NITRATE CONTENT FROM WELL WATER IN A REMOTE ESKIMO VILLAGE,
Arctic Health Research Center, College, Alaska.
B. B. Benson.
Journal of Environmental Health, Vol 30, No 2, p 164-170, September-October, 1967. 3 fig, 3 tab, 9 ref.

Descriptors: Wells, Water wells, Water quality, Hardness, *Nitrates, *Public health, *Water treatment, *Desalinization, Potable water.
Identifiers: *Nunivak Island, *Methemoglobinemia, Nitrate poisoning.

The well water in the village of Mekoryuk is very high in nitrate: 266 mg/l in the village well and 75 mg/l in the school well. This nitrate concentration can cause methemoglobinemia in infants under two months of age if ingested. Due to village conditions and the economic situation, it is not practical to treat the entire village water supply, but only that portion used by nursing mothers and infants. By passing the water through small demineralizers made for use with steam irons, the nitrate concentration can be reduced to safe levels. The change in color of the resin from purple to yellow eliminates the need for chemical tests on the effluent to determine when the demineralizer is exhausted. (Campbell-NWWA)
W74-00949

CORROSION CONTROL IN WATER WELLS,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
A. P. Black, J. I. Garcia-Bengochea, and J. R. Hurtado.

Chemical Engineering Progress Symposium Series, Vol 64, No 90, p 187-190, 1968. 3 fig, 2 tab, 6 ref.

Descriptors: Wells, *Water wells, Corrosion, Damages, Chemical reactions, *Corrosion control, Chemical analysis, *Water treatment, *Carbon dioxide.
Identifiers: *Neutralization, *Saturated lime water, Calcium carbonate scale.

The municipal water supply of the city of Maracaibo, Venezuela, is obtained from more than forty wells penetrating sand strata. While water from the various wells differs somewhat in chemical quality, water from most is very high in carbon dioxide (60 to 100 ppm) and has pH values in the range 6.1 to 6.5. Corrosion is rapid and severe, and annual replacement costs have exceeded \$100,000. Field tests indicate that this condition can be corrected and corrosion practically eliminated by the addition of a saturated solution of lime water at a point in the well somewhat below the pump section. The lime saturator and the method of preparing and feeding the lime solution are described. An initial test of the method, with a new pump and column, over a period of 81 days showed that practically no corrosion took place during that period, and a second test over a period of approximately 6 months confirmed the first results. (Smith-NWWA)

W74-00952

PRELIMINARY RESULTS OF THE PROJECT FOR CONTROLLING AND PREVENTING SCHISTOSOMIASIS IN THE LOWER MANGOKY (MALAGASY REPUBLIC),
Institut Tropical Suisse, Basel.

A. A. Degremont, R. Geigy, and P. Perret.
Acta Trop, Vol 29, No 2, p 101-174, 1972, Illus, English summary.
Identifiers: *Bulinus-liratus, Bulinus-obtusispis, Control, *Malagasy Republic (Mangoky), *Niridazole, Parasit-drug, Schistosoma-hematobium, Schistosoma-mansoni, *Schistosomiasis, Vector.

The aims of the Mangoky Project for controlling and preventing schistosomiasis in Lower Mangoky, Madagascar were two-fold: to check endemic schistosomiasis in the irrigated Samangoky area by simultaneously combining all the methods of schistosomiasis control: chemotherapy using niridazole; chemical treatment, using N-tritylmorpholine, of all the water where intermediate hosts were found; health education and supervision of the installation of irrigation and development of new areas and to try to define the methods of controlling and preventing schistosomiasis over newly-developed irrigated area to calculate the profitability of such a project and to plan its organization. Almost all (85%) of the approximately 10,000 inhabitants were examined and those found infected underwent treatment with niridazole. The number of Schistosoma mansoni cases diagnosed during systematic examinations was 698 (3.7%) while the number of S. haematobium cases diagnosed was 2844. Monthly or quarterly malacological investigations of about 400 habitats revealed the existence of 9 aquatic molluscs. Bulinus obtusispis was considered the main intermediate host of S. haematobium in Lower Mangoky. B. liratus was not involved in transmission of S. haematobium, although future risk of transmission by B. liratus was not completely negligible. The anti-schistosomiasis campaign carried out over 5 yr was very effective; the infection rate dropped from 13%-3% in the whole area. This project can serve as model for preventing and controlling schistosomiasis in other newly-developed irrigated regions of Madagascar and Africa.—Copyright 1973, Biological Abstracts, Inc.
W74-00992

5G. Water Quality Control

TRENDS IN ENVIRONMENTAL LAW RELATED TO WATER RESOURCES PLANNING,
Auburn Univ., Ala. Center for Urban and Regional Planning.

For primary bibliographic entry see Field 06E.
W74-00552

SUBURBAN AMERICA: POPULATION DYNAMICS AS RELATED TO WATER RESOURCES PLANNING,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W74-00553

GROUND WATER POLLUTION PROBLEMS IN MINNESOTA,
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 05B.
W74-00570

PROBLEM DEFINITION STUDY: EVALUATION OF HEALTH AND HYGIENE EFFECTS OF THE DISPOSAL OF PESTICIDES AND PESTICIDE CONTAINERS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
T. A. Miller.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

Available from NTIS, Springfield, Va., 22151 as AD-757 603 Price \$3.00 printed copy; \$1.45 microfiche. Report No 73-01, August 1972. 41 p, 3 fig, 2 tab, 126 ref, 4 append.

Descriptors: *Waste disposal, *Pesticides, *Water pollution control, Methodology, Chemical degradation, Biodegradation, Underground waste disposal, Insecticides, Herbicides, Evaluation.

Identifiers: *Thermal degradation, *Army surplus pesticides, Chemical treatment.

The disposal of Department of the Army surplus pesticides of all types presents serious problems. Significant among the various types of pesticides are large quantities of organochlorine insecticides and phenoxy acid herbicides. Thermal degradation or ground deposition are the disposal methods with the greatest potential for handling large quantities of material in these categories. Chemical treatment has disposal potential for some pesticides on a small-scale basis, and may have application in the decontamination of empty pesticide containers. Recommendations are made concerning research determine: methods for the small-scale disposal of all types of pesticides and empty pesticide containers; thermal degradation temperatures for organochlorine insecticides and phenoxy acid herbicides, including methods for the secondary disposal of ash and scrubbing liquids; and criteria for the ground disposal of pesticides by deposition in a sanitary landfill or other special excavation, or by deposition in chemically or biologically active soils. (Woodard-USGS)

W74-00580

A REPORT OF PROGRESS AND CONCLUSIONS, (WASHINGTON, D.C. METROPOLITAN AREA WATER RESOURCES).

Washington Area Interstate Water Resources Program, D.C.
For primary bibliographic entry see Field 06D.

W74-00583

REMOTE SAMPLER FOR DETERMINING RESIDUAL OIL CONTENTS OF SURFACE WATERS;

Naval Ship Research and Development Center, Annapolis, Md.

P. Schatzberg, and D. F. Jackson.

Available from NTIS, Springfield, Va., 22151 as AD-760 217; Price \$3.00 printed copy; \$1.45 microfiche. Final Contract Report, October 1972. 23 p, 3 fig, 6 tab, 2 ref, 2 append. USCG Contract MIPR-Z-70099-0-00584.

Descriptors: *Oil spills, *Oil pollution, *Oily water, *Separation techniques, *Water pollution control, Model studies, Laboratory tests, Sorption, Coasts, Estuaries, Oil-water interfaces, Sampling, Monitoring, Water pollution, *Pollutant identification, Pollution abatement.

Identifiers: Oil pollution baselines.

A sample flow-through device has been developed which, in conjunction with a skimmer and pump, can process 100 to 200 liters or more of surface water, removing any oil present in a separate phase. Thus concentrated, the oil can be extracted at a laboratory, its quantity and nature determined, and when related to the volume of water processed through the sampler, provide oil concentration data on a time integrated basis. Key to the development of this device was identification of a sorbent material which would quantitatively remove oil from a moving water stream and permit simple extraction of that oil in a laboratory. A laboratory apparatus was designed to generate a flowing water stream containing various quantities of oil. Experiments showed that 5-25 ppm oil in a flowing water stream is quantitatively absorbed by the sorbent. The concentrated oil is easily removed from the sorbent with carbon tetrachloride used as solvent and a Soxhlet extractor. The sorbent is regenerated by this process and

can be reused many times. Concentration of the extracted oil is determined by infrared spectrophotometry. (Woodard-USGS)

W74-00584

LOW-COST FACILITIES FOR THE BACTERIOLOGICAL EXAMINATION OF DRINKING WATER SAMPLES,

Nairobi Univ. (Kenya). Dept. of Civil Engineering. D. D. Mara.

Water Research, Vol 7, No 8, p 1243-1245, August 1973. 1 tab, 5 ref.

Descriptors: *Water analysis, *Laboratory equipment, *Coliforms, Costs, Cultures, *Potable water, Bioindicators, *Capital costs.

Identifiers: Most probable number test, Culture media.

The equipment required to provide a small laboratory in up-country areas in developing countries with facilities for five coliform examinations (at 37°C) per day by the five tube 10 ml MPN method is described. The capital cost (excluding installation, buildings, etc.) is approximately 290 dollars and the running cost per test approximately 7 cents. (Little-Battelle)

W74-00630

MARKET PROBLEMS IN THE DISTRIBUTION OF EMISSION RIGHTS,

Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.

M. Rose.

Water Resources Research, Vol 9, No 5, p 1132-1144, October 1973. 3 fig, 23 ref, 4 append.

Descriptors: *Distribution, *Permits, *Bids, *Marginal costs, *Pollution abatement, Treatment, Prices, Control, Optimization, Mathematical models, Marketing, Systems analysis.

Identifiers: *Emission rights, *Waste discharge, *Cost minimization, Waste loads, Calculus.

Some of the market problems inherent in developing a system of emission rights are considered. Cases are analyzed in which there are single and multiple dischargers and in which the supply of available permits is fixed, variable, or variable up to a specified limit. An auction-type bidding process is analyzed. A public authority distributes permits providing the right to discharge specified waste loads into a medium. Potential purchasers of the permits may perceive themselves as having some measure of control over the permit prices through their bids. It is shown that given sufficient information on the nature of bidding strategies, the authority can infer the firms marginal treatment cost functions from their bidding behavior and may therefore be in a position to impose the optimal solution of discharges. In cases in which the optimal number of rights is not known but the marginal damage costs are known, the auction market can generate information that allows determination of the optimal price and number of rights to make available. The public authority should: Maximize the difference between the value of pollution damages avoided and the cost of reducing the damages (minimize the sum of the remaining damages and required treatment). This process is modeled using calculus. (Bell-Cornell)

W74-00674

MICHIGAN WATER RESOURCES ENFORCEMENT AND INFORMATION SYSTEM,

Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.

G. Guenther, D. Mincavage, and F. Morley.

Copy available from GPO Sup Doc as EPI.23 73-020, \$1.75; microfiche from NTIS as PB-224 800, \$1.45. Environmental Protection Agency Socioeconomic Study Series, Report EPA-R-57-020, July 1973. 161 p, 70 exhibits. EPA Project 16090 FSR.

Descriptors: *Information retrieval, Data storage and retrieval, *Data processing, Water pollution control, Monitoring, State jurisdiction, *Michigan, Data collections, Documentation, Information exchange.

Identifiers: *Water quality enforcement, Exception reporting, Computer graphics, *Information systems, STORET system.

The project demonstrated an interactive Federal/State water-pollution control, enforcement, and information system, including interactive computer graphics as a method of output presentation. Two systems were interfaced—Michigan's Water Information System for Enforcement (WISE) and EPA's STORET system. The WISE system is used to alert enforcement personnel to problems through exception reporting, and to provide follow-up information on these problems. STORET is utilized as a storage and retrieval system for water quality and inventory information. As information enters WISE, certain inputs are coded for storage in STORET. The interface mechanism is a common numbering system. Because WISE is modular in design, it can be used in part or in total by other agencies. The demonstration indicated that careful consideration should be given to the information that will comprise the computer file. Administrative, procedural, and auditing techniques should be completely set down before proceeding with management's commitment to the system. Microfilm should be used when feasible, both as Computer Output Microfilm (COM) and in manual files. (EPA) W74-00701

DEVELOPMENT OF A SELECTIVE ALGACIDE TO CONTROL NUISANCE ALgal GROWTH,

Dow Chemical Co., Freeport, Tex. Texas Div.

B. L. Prows, and W. F. McIlhenny.

Copy available from GPO Sup Doc as EPI.23; 660-73-006, \$1.50; microfiche from NTIS as PB-225 027/2, \$1.45. Environmental Protection Agency, Ecological Research Series, Report EPA-660/3-73-006, August 1973. 126 p, 27 fig, 28 tab, 45 ref. EPA Project 16010 EDJ, Contract 68-01-0076.

Descriptors: *Algaecides, *Algal control, *Nuisance algae, *Cyanophyta, Assay, *Biocontrol, *Chem control, Phaeophyta, Organic compounds, Pesticides, Aquatic weed control.

Identifiers: Selective algaecide, *Anabaena, *Microcystis, Analogs, Test compound, Phagocytic, Selective screening, Ochromonas.

The objective was to develop a compound which would effectively and economically control the growth of nuisance species of blue-green algae with a minimum impact on desirable forms of life in the aquatic environment. A computerized structure search of more than 100,000 compounds was made to select the analogs of the following four Phase I prime candidates: 2,5-Dichloro-3,4-dinitrothiophene; (5-Chloro-2-(p-nitrophenyl)phenyl)iodoniumchloride; 4-Amino-2,5-dibromophenylthiocyanate; and 1,1-Dimethyltetradecylamine, hydro-chloride. Through this endeavor 1309 compounds were selected, 41 of which emerged from a rapid, agar-plate screening as candidates for final laboratory screening tests. A golden-brown flagellate, Ochromonas ovalis, which exhibited phagocytic activity against the blue-green alga, *Microcystis aeruginosa*, was discovered during Phase I. Further research and development of biological-chemical control system included studies involving several species of Ochromonas and conditions which would enhance their phagocytic activity against *Microcystis aeruginosa*, with *Ochromonas ovalis* proving to be the most voracious feeder. (EPA) W74-00702

INTERMEDIA ASPECTS OF AIR AND WATER POLLUTION CONTROL,

Stone (Ralph) and Co., Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 05B.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

W74-00703

QUALITY MANAGEMENT FOR WISCONSIN: A REPORT ON PRESERVING AND IMPROVING THE QUALITY OF THE AIR, LAND AND WATER RESOURCES.

National Resources Council of State Agencies, Madison, Wisconsin, March 1971. 118 p.

Descriptors: *Wisconsin, *Air pollution, *Land use, *Water resources, *Water quality, Governmental interrelations, Legislation, Environmental sanitation, Standards, Soil conservation, Monitoring, Solid wastes, Comprehensive planning, Municipal wastes, Taxes, Industrial wastes, Zoning, Waste disposal, Farm wastes, Litter, Flood plain zoning, Aesthetics, Mining, Forests, Optimum development plans, Parks, Highway beautification, Burning, Dredging, Inland waterways, Dams, Rivers, Groundwater, Recreation, Eutrophication, Thermal pollution, Pesticides.
Identifiers: Motor vehicle emissions, Industrial emissions, Highway littering, Billboards.

Functions of agencies delegated by Wisconsin Legislature to protect, develop, and manage Wisconsin air, land and water are reported. The State program—problems, laws, regulations, and present procedures are elucidated and those of counties and municipalities, all as affected by federal legislation. Regarding soil conservation, major accomplishments, soil surveys, budget, legal constraints, and present activities with future needs are discussed. Solid waste disposal problems in municipal, industrial, and private areas are presented. Although there are laws and regulations in relation to agricultural effects upon water pollution, greater involvement of local people is needed in identifying pollution sources and correcting problems. Examination of highway littering and floodplain-shoreland management prompts formulation of state policy on land development. Although ordinances are directed toward mining and subsequent land rehabilitation, a Mineral Conservation and Surface Mining Reclamation Act is being formulated. Aesthetic amenities—billboards, scenic easements, highway beautification, forest and park lands—are presented with recommendations. Surface and ground water quantity and quality, wild and scenic rivers, and public water supply were studied and recommendations given. Basic considerations involve need for an interagency coordinating council, a long-range comprehensive state water resources plan, interagency effort, and expansion of information systems. (Jones-Wisconsin)
W74-00715

THE EFFECTS OF STRIP MINING UPON NAVIGABLE WATERS AND THEIR TRIBUTARIES: DISCUSSION AND SELECTED BIBLIOGRAPHY.

Pittsburgh Univ., Pa. Graduate Center for Public Works Administration.
For primary bibliographic entry see Field 05C.
W74-00725

ENVIRONMENTAL CONTROL OF GAMETOGENESIS IN LAMINARIA SACCHARINA. II. CORRELATION OF NITRATE AND PHOSPHATE CONCENTRATIONS WITH GAMETOGENESIS AND SELECTED METABOLITES, Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences. For primary bibliographic entry see Field 05C. W74-00726

PROTECTION OF WATER AGAINST POLLUTION, For primary bibliographic entry see Field 05C. W74-00731

STUDY OF THE EXTRACELLULAR POLYSACCHARIDES PRODUCED BY A BLUE-GREEN ALGA, A-37, Mississippi State Univ., State College. Dept. of Microbiology. W. S. Wang, and R. G. Tischer. Archiv für Mikrobiologie, Vol 91, No 1, p 77-81, 1973.

Descriptors: *Biochemistry, *Cyanophyta, Anabaena, Chromatography, Polymers, Carbohydrates.
Identifiers: *Anabaena flos-aquae, *Polysaccharides (Extracellular).

Separation of neutral and acidic polysaccharides from the heteropolymers produced by *Anabaena flos-aquae* A-37 is described and their monosaccharide composition elucidated. Molar ratio of the constituent monosaccharides of the polymers varies widely from species to species and variation even occurs within the same species under different conditions. Two types of polysaccharides were separated from the extracellular polysaccharide by ion exchange chromatography. The neutral polysaccharide is composed of mainly glucose with minor amounts of xylose in a molar ratio of 8:1. Glucose is believed to constitute the polysaccharide core to which xylose is attached. The acidic polysaccharide is composed of glucose and uronic acid as the major monomers with equal amounts of xylose and ribose as the minor constituents. The molar ratio of the monomers found in the acidic polymer is 6:1:1:10 as glucose:xylose:ribose:uronic acid. Chemical analyses showed that the extracellular polysaccharide consists of more neutral polymer (62%) than the acidic polymer (38%). The high proportion of glucose found in the neutral fraction suggests the major role of this monosaccharide acting as the core structure of the polymer. (Jones-Wisconsin)
W74-00734

MALEZAS ACUATICAS, AQUATIC WEEDS, J. M. BRISTOW, Colombian Agricultural Inst., Bogota. For primary bibliographic entry see Field 04A. W74-00736

BODEGA: A CASE HISTORY OF INTENSE CONTROVERSY, For primary bibliographic entry see Field 06G. W74-00738

LAKE WASHINGTON, For primary bibliographic entry see Field 05C. W74-00739

PROTECTING OUR WATER ENVIRONMENT. Denver Regional Council of Governments, Colo. 1973. 13 P, 1 APPEND.

Descriptors: *Water quality control, *Planning, *Sewerage, *Environmental effects, Water quality standards, Evaluation, Waste water disposal, Vegetation effects, Social aspects, Ecology.
Identifiers: *Denver (Colo.).

Information is provided to the public on the Denver Water Quality Management Planning Program in preparation for 5 county public meetings. The Water Quality Program is concerned with the quality of the region's rivers and streams, the quality of the environment near these water resources, and wastewater disposal systems. The reasons for planning for water quality, criteria involved in designing wastewater disposal systems, the present system and alternative plans for improving the system, and an environmental evaluation of three of the alternatives are presented. Criteria discussed include environmental considerations such as geology, soils, vegetation, fau-

na, archaeology, and aesthetics, regulatory standards at both state and federal levels, and operational criteria involving economics and technology. The main alternatives considered involve the consolidation of the existing system of over 30 treatment plants to 3 or 4 large plants. One of the 4-plant alternatives was determined to have the least detrimental environmental effects. Recommendations to minimize detrimental impacts include the use of various environmental experts to survey proposed facility locations, the avoidance of certain land uses, vegetation types, and habitats, and the development of an overall environmental management plan for the region. (Elfers-North Carolina)
W74-00743

REPORT TO THE GOVERNOR AND THE LEGISLATIVE COMMISSION: POLLUTION ABATEMENT PROJECT, LAS VEGAS WASH AND BAY.

Las Vegas Valley Water District, Nev.
For primary bibliographic entry see Field 05D.
W74-00744

SEWER SYSTEM COST ESTIMATION MODEL. Voorhees (Alan M.) and Associates, Inc., McLean, Va. For primary bibliographic entry see Field 05D. W74-00745

A REPORT UPON WEST CENTRAL MARICOPA COUNTY, ARIZONA: VOLUME I, A STUDY OF PHYSICAL ENVIRONMENTAL FACTORS AS A BASIS FOR LAND USE PLANNING.

Maricopa County Planning and Zoning Dept., Phoenix, Ariz.
For primary bibliographic entry see Field 03D.
W74-00746

THE ECONOMICS OF THE CATTLE FEEDING INDUSTRY IN ARIZONA, Arizona Univ., Tucson. Dept. of Agricultural Economics. For primary bibliographic entry see Field 06C. W74-00758

SOME ASPECTS OF WEED CONTROL IN VINEYARDS, (IN ITALIAN), A. Martinoli. Not Mal Piante. 85 p, 111-130, 1971, Illus. (English summary). Identifiers: Control, Drainage, *Herbicides, Mulch, Pyridyls, Rainfall, Soil, *Vineyards, *Weed control.

The concept of controlled weeding is discussed, including the products which can be used and the aspects which characterize the continual use of these desiccants. The spread and control of resistant weeds, the preparation of natural mulch with desiccated weeds, the stability of soil structure and the possibility of 'utilizing' the benefits of a weed cover during adverse weather conditions and alternating mowing with chemical desiccation are described. (Penetration of the rain in the soil is facilitated by the presence of a sod toother with better drainage during extensive periods of rainfall.) A description is given of the functions and mechanism of action of special low pressure fan nozzles, used to reduce the danger of spray drift. The availability of a rapid acting desiccant capable of scorching the green parts of weeds in any phase of development and at any time of the year without the danger of phytotoxic accumulation in the soil, provides the prospects of new interesting techniques. Residual herbicides, at reduced doses, can thus be used with increased crop safety and the partially controlled weeds can be completely killed by the pyridyls.—Copyright 1973, Biological Abstracts, Inc.
W74-00767

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

BANKS STUDY BASIN CLEANUP.

For primary bibliographic entry see Field 05D.
W74-00772

SAMPLING AND ANALYSIS OF CHEMICAL POLLUTANTS IN RIVER WATER,

Lee Conservancy Catchment Board (England).
For primary bibliographic entry see Field 05A.
W74-00773

CHEMICAL ANALYSIS OF WATER EF-FLUENTS -- LESSONS FROM THE U.S. (ARMY CORPS OF ENGINEERS) PERMIT PROGRAM,

Institute of Paper Chemistry, Appleton, Wis. Div. of Natural Materials and Systems.

For primary bibliographic entry see Field 05A.
W74-00791

ENGINEERING REPORT ON SPECIAL ASSESSMENT STORM SEWER DISTRICT FOR THE NORTHEAST INDUSTRIAL DISTRICT, CITY OF KANSAS CITY, MISSOURI.

Riddle Engineering, Inc., Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W74-00802

PRELIMINARY STUDY FOR CENTRAL INDUS-TRIAL DISTRICT SEWERS, DEPARTMENT OF PUBLIC WORKS, KANSAS CITY, MISSOURI.

Shaffer, Kline and Warren, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W74-00803

ENVIRONMENTAL HEALTH ANALYSIS.

Saginaw County Metropolitan Planning Commission, Mich.

For primary bibliographic entry see Field 05B.
W74-00808

CARGO SPILL PROBABILITY ANALYSIS FOR THE DEEP WATER PORT PROJECT,

Woodward-Lundgren and Associates, Oakland, Calif.

For primary bibliographic entry see Field 05B.
W74-00819

GAS REQUIREMENTS TO PRESSURIZE ABANDONED DEEP MINES,

NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div. J. D. Robins.

Copy available from GPO Sup Doc as EPI.23:670-73-054, \$2.00; microfiche from NTIS as PB-224 931/6, \$1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-054, August 1973. 192 p, 36 fig, 50 tab, 18 ref. EPA Project 1410 EFL.

Descriptors: *Mine drainage, *Water pollution control, Pyrite, Oxidation, *Pennsylvania, Acid mine water, Gases.

Identifiers: *Mine pressurization, *Leak detection, Oxygen free atmospheres, Ohiopyle State Park (Penn), Inert gas.

The objective was to determine the gas injection rates needed to develop and maintain slight pressures within a mine over ambient conditions during changes in the barometric pressure. The ultimate aim of the project was to determine the feasibility of blanketing an abandoned deep mine with an inert gas in order to eliminate the acid mine drainage. Pressurization tests were conducted at two typical abandoned deep mine sites in southwestern Pennsylvania. The study also included a state-of-the-art evaluation of existing technology which could be used to locate points of gas leakage from deep mines. The findings of this literature survey were implemented in several full-scale leak detection experiments. While pressurization tests conducted at the larger (50 acres) test mine site were generally inconclusive, the

final test results obtained at the smaller (15 acres) mine site were encouraging. Slight positive differential mine pressure could be maintained over extended periods of time at air injection rates as low as 150 cfm. It was also found that barometric pressure fronts had little or no effect on differential mine pressures and that mine pressure differentials immediately dissipated at the cessation of air injection. The experimental data collected throughout this study is presented in the Appendix. (EPA)
W74-00836

SOME IMPORTANT PROBLEMS IN MODERN LIMNOLOGY (O NEKOTORYKH VAZHNYKH ZADACHAKH SOVREMENNOGO OZEROVEDENIYA),

Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.

For primary bibliographic entry see Field 02H.
W74-00839

REGIONAL POLLUTION STUDY: INVENTORY AND ANALYSIS.

Tulsa City-County Health Dept., Okla. Environmental Health Div.

For primary bibliographic entry see Field 05B.
W74-00849

WALSH V. SPADACCIA (PROCEEDING TO SET ASIDE DETERMINATION OF TOWN BOARD APPROVING CONSTRUCTION PLANS WHICH DID NOT CONSIDER POLLUTION OF LAKE).

For primary bibliographic entry see Field 06E.
W74-00857

INCREASING PROTECTION FOR OUR WATERS, WETLANDS, AND SHORELINES: THE CORPS OF ENGINEERS.

For primary bibliographic entry see Field 06E.
W74-00858

THE DRAFT UNITED NATIONS CONVENTION ON THE INTERNATIONAL SEABED AREA--AMERICAN PETROLEUM INSTITUTE POSITION,

American Petroleum Inst., New York.

L. W. Finlay.

Natural Resources Law, Vol 4, p 73-83, January 1971. 4 ref.

Descriptors: *International laws, *United Nations, *Oil, *Mining, *Seabeds, Continental shelf, Legal aspects, Exploitation, Mineralogy, Governments, Legislation, Planning, Law of the sea, Water resources development.

The draft undertakes to establish a comprehensive petroleum and mining code for the entire seabed area of the high seas beyond the depth of 200 meters. A representative of the Petroleum Institute maintains that the draft convention is critically defective in its failure to provide adequate protection to United States off-shore mineral interests and that a further statement of presidential policy for the transitional period is urgently needed. Moreover, with appropriate administrative action, existing legislation is sufficient to encourage increased efforts in the recovery of seabed resources. Because of the killing effects of the proposed renunciation of all rights of the U.S. to natural resources of the continental margin beyond the 200-meter isobath, the problem cannot be solved by minor changes in the draft. (Mockler-Florida)
W74-00859

A BILL TO PROVIDE FOR THE ESTABLISH-MENT OF THE POTOMAC BASIN NATIONAL RIVERWAYS.

For primary bibliographic entry see Field 06E.

W74-00864

COMMONWEALTH V. BARNES AND TUCKER COMPANY (SUIT FOR MANDATORY INJUNC-TION REQUIRING DEFENDANT TO TREAT ACID MINE DRAINAGE FROM MINE).

For primary bibliographic entry see Field 06E.
W74-00866

ARE OCEAN POLLUTERS SUBJECT TO UNIVERSAL JURISDICTION--CANADA BREAKS THE ICE,

J. C. Klotz.

International Law, Vol 6, No 4, p 706-717, October 1972. 58 ref.

Descriptors: *Canada, *International law, *Law of the sea, *Pollution abatement, *Conservation, *Arctic Ocean, Resources, Legal aspects, Oil spills, Jurisdiction, Governments, Regulation, Damages, Ecosystems, Ecology, Administration, Legislation, Interest.
Identifiers: *Coastal waters, *Territorial waters.

The legality on the international level of Canada's Arctic Waters Pollution Prevention Act is discussed. By this Act Canada asserts jurisdiction over activities in its Arctic waters through a national regime governing everything from penalties for polluters to the construction of ships of any nation traversing the international waters of the Canadian Arctic. The Act defines 'Arctic waters' as all those waters above latitude 60° north within 100 miles of shore plus continental shelves or other substrata that Canada has the right to exploit. The legality of Canada's action is evaluated by comparing it with customary jurisdiction over ocean waters exercised by nation states. The areas of comparison are: (1) territorial principle--territorial sea and contiguous zones, (2) protected interest principle--extraterritorial effect of laws to conduct affecting security, (3) nationality of the offender, (4) nationality of victim, (5) universality principle--protect universal interests and punish offenses against the law of nations. The legislation is a valid excuse to protect universal interests, but the necessity of international regulation to protect ocean resources is stressed. (Napolitano-Florida)
W74-00867

NATIONAL RESOURCES DEFENSE COUNCIL INC. V. GRANT (ACTION TO PERMANENTLY ENJOIN CONSTRUCTION OF WATERSHED PROJECT).

For primary bibliographic entry see Field 06E.
W74-00868

EFFLUENT NEIGHBORS: THE MEXICO-UNITED STATES WATER QUALITY DILEMMA,

C. R. Johnston, Jr.

California Western International Law Journal, Vol 3, No 1, p 152-173, December 1972. 114 ref.

Descriptors: *Water pollution, *International law, *Drainage basins, Water quality standards, Legal aspects, Governments, Legislation, Governmental interrelations, Water resources development, Federal government, Rio Grande River, Colorado River, United States, Mexico.

Water pollution problems shared by the United States and Mexico as a result of sharing three international drainage basins: the Rio Grande, Colorado and Tijuana river systems are discussed. Recognizing the contemporary problems international water quality control, the concepts and principles of international law which apply to drainage basins are described. The provisions that the United States and Mexico have made concerning water quality control of the subject drainage basins are discussed. A proposed solution to the Mexican-United States water quality dilemma is submitted. The American and Mexican govern-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

ments must officially recognize the geographic unity of an international drainage basin and the application to such basins of the principle of equitable utilization in order to solve their present international water quality dilemma. Basin agencies would then provide for the realistic control of international drainage basin water quality. (Mockler-Florida)
W74-00869

WATER POLLUTION—USER OF CITY SEWER SYSTEM CREATES NUISANCE AGAINST LOWER RIPARIAN, J. E. Crowe, Jr. Missouri Law Review, Vol 38, p 161-170, Winter 1973. 59 ref.

Descriptors: *Arkansas, *Missouri, *Riparian rights, *Sewage disposal, *Water pollution control, Damages, Reasonable use, Public utilities, Contracts, Benefits, Third party effects, Waste disposal, pollution abatement, Legal aspects, Judicial decisions.

Identifiers: *Hazardous substances (Pollution), *Nuisance (Legal aspects).

Possible liability of the users of a city sewer system to a lower riparian in an action based upon nuisance is discussed. Plaintiff-appellant sought damages as lower riparian against defendant-appellee for discharging certain noxious wastes into the city sewer system thereby overloading the sewage treatment plant and polluting a creek to plaintiff's detriment. Plaintiff alleged defendant was under a contract with the city to eliminate from its deposits into the sewer system 'all offensive and noxious waste products' and further alleged that the purpose of the contract was to prevent overloading the system and, in turn, harm to riparian downstream from the sewage facility. The state supreme court reversed holding that a party who owes no obligation to third persons or the public in general may contract to assume an obligation to use due care toward such third persons or the public in general. Rights of lower riparians based upon nuisance and reasonable use theory, liability for pollution caused by discharge into a municipal water system, control of discharge, and possible applications of the subject case in other situations are discussed. (Napolitan-Florida)
W74-00870

REPORT OF PROCEEDINGS AT PUBLIC HEARING RELATING TO AN APPLICATION FILED BY AROUSED RESIDENTS OF CROWDERS CREEK INC. REQUESTING RECLASSIFICATION OF CROWDERS CREEK, CATAWBA RIVER BASIN, CLEVELAND AND GASTON COUNTIES.

Water and Air Quality Control Committee, North Carolina Board of Water and Air Resources, Raleigh, May 19, 1972. 63 p.

Descriptors: *North Carolina, *Legislation, *Water quality standards, *Recreation, Water pollution sources, Industrial wastes, Sewage administration, Water pollution control, Water law, Commissions, Impaired water quality, Municipal wastes, Public health.

The application requested reclassification of Crowders Creek so that it may be protected as suitable for water-body contact recreation. The petition for reclassification emphasized that the stream and its tributaries are presently used and have been used by at least two municipalities and no fewer than nine North Carolina businesses and industries as an outlet and outfall sewer for municipalities and industrial wastes. Moreover, on numerous occasions, overflow of municipal raw sewages and deliberately dumped raw industrial wastes, both organic and inorganic, have taken place to the detriment of the stream and to the un-

told damage of the lower riparian owners and users. (Mockler-Florida)
W74-00871

RESTORE RURAL WATER AND WASTE DISPOSAL GRANT PROGRAMS.

Hearings—Comm. on Agriculture, U.S. House of Representatives, 93rd Cong, 1st Sess, February 19-20, 1973. 54 p.

Descriptors: *Legislation, *Water quality standards, *Sewage treatment, *United States, Governments, Waste treatment, Environmental sanitation, Public health, Sewage effluents, Water treatment, Water pollution sources, Sewage, Sewage systems, Grants.

Identifiers: *Congressional hearings, *Consolidated Farm and Rural Development Act.

These hearings concerned the bill to restore the rural water and sewer grant program under the Consolidated Farm and Rural Development Act. Testimony at the hearings indicated that there is no other federal program which small villages and towns can turn to for grant assistance in bridging the sizable gap between what is required by way of water treatment facilities and what is fiscally practical. The program is needed to enhance the quality of rural America's natural environment and safeguard the health and physical well-being of the millions of U.S. citizens residing in small rural communities. Most rural communities cannot carry the bonded indebtedness for the whole cost of the needed water and sewer systems, and, as a result, representatives of many towns appeared to give testimony at the hearings on this proposed legislation. In the past, this program has materially contributed to the construction of about 6500 rural water and sewage treatment plants. The testimony indicated that it would be unwise, unrealistic, and unfair to terminate the Rural Water and Sewer Grant Program. (Mockler-Florida)
W74-00875

LOST CREEK WATERSHED, NEWTON COUNTY, MISSOURI (FINAL ENVIRONMENTAL STATEMENT).

Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W74-00880

GILLHAM LAKE, COSSATOT RIVER ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00881

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX II (PHOTOGRAPHS), APPENDIX III (ENVIRONMENTAL ELEMENTS), FINAL ENVIRONMENTAL IMPACT STATEMENT.

Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00882

OPTIMAL ALLOCATION OF ARTIFICIAL AERATION ALONG A POLLUTED STREAM USING DYNAMIC PROGRAMMING,

California Univ., Los Angeles. Dept. of Engineering Systems.
S. Chang, and W. W-G. Yeh.

Water Resources Bulletin, American Water Resources Association, Vol 9, No 5, p 985-997, October 1973. 3 fig, 9 ref.

Descriptors: *Water quality control, *Stream improvement, *Dissolved oxygen, *Dynamic programming, Algorithms, Optimization, Resource allocation, Mathematical models, Systems analysis, Costs, Numerical analysis.

Identifiers: *Artificial aeration, *Cost minimization, Mass balance equation, Langrange multiplier.

When a series of aerators are used to raise the level of dissolved oxygen in a polluted stream through instream artificial aeration augmentation, the system is governed by the basic dissolved oxygen mass balance equation with the existence of artificial aeration as its boundary conditions. A mathematical model is developed for the optimization of the allocation of aeration capacity to each of the series of aerators subject to a limitation on total available aeration capacity. The objective function is to minimize the sum of the squares of the aeration costs and the costs incurred by damaging or unnecessarily improving the system. The original constrained allocation problem is simplified by converting it to an unconstrained one via use of Lagrange multipliers. A discretized dynamic programming algorithm is formulated for finding the optimal allocation policy. A typical optimal aeration capacity allocation policy and its corresponding dissolved oxygen sag profile for the illustrated numerical example is presented, and the relationship between the total available aeration capacity and Lagrange multiplier is also developed treating weighting factors as parameters. (Bell-Cornell)
W74-00883

NONLINEAR EFFLUENT CHARGES,

California Univ., Riverside.

T. A. Ferrar.
Journal of the Institute of Management Science: Application, Vol 20, No 2, p 169-178, October 1973. 3 fig, 14 ref.

Descriptors: *Regions, Effluents, *Taxes, *Pollution abatement, *Standards, Resource allocation, Information, Water pollution control, Costs, Constraints, Algorithms, Mathematical models, Systems analysis, *Pollution taxes (Charges).

Identifiers: *Environmental quality, Incentive-feedback algorithm, Cost minimization.

An effluent taxation structure for meeting a specified standard of regional environmental quality is derived. The significant operational weakness of the effluent charge technique in environmental management is its fundamentally static applicability. A nonlinear effluent taxation policy is developed which will alleviate this weakness. It is demonstrated that the nonlinearity of the proposed charge scheme displays equilibrium results identical to linear user-charge programs but elicits superior dynamic characteristics. Moreover, through use of an iterative stimulus-response algorithm, the technical information transfer among sectors is minimized by mapping response surfaces for polluter behavior. These continuously updated response patterns are then used to guide the system to a social optimum. The allocation procedure involves an incentive-feedback algorithm that iteratively rations the available environmental resource among the polluters in accordance with a cost-minimization objective. The progressive taxation program developed induces polluters to modify their effluent discharge levels in accordance with an environmental control board's specifications while insuring that these specified levels are not violated. Recognizing the stochastic nature of the optimal allocation of environmental resources and the need to reckon the existence of adjustment lags within any operational context, it is argued that meaningful policing of environmental quality will require the nonlinear taxation approach. (Bell-Cornell)
W74-00886

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME II.

Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00889

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY—PROCESSES AND RESOURCES, VOLUME I.
Corps of Engineers, Baltimore, Md.

For primary bibliographic entry see Field 02L.
W74-00890

CORROSION CONTROL IN LARGE VOLUME PUMPING BRINE WELLS,
Oilwell Research, Inc., Long Beach, Calif.
For primary bibliographic entry see Field 08G.
W74-00937

GROUND WATER POLLUTION AND CONSERVATION,
For primary bibliographic entry see Field 04B.
W74-00938

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT SULFATE-REDUCING BACTERIA (BUT WERE AFRAID TO ASK),
For primary bibliographic entry see Field 05B.
W74-00942

CORROSION AND INCRASTATION GUIDELINES FOR WATER WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08G.
W74-00948

WELL CONSTRUCTION HELPS DETERMINE WATER QUALITY,
Agricultural Research Service, Beltsville, Md.
Farmstead Water Systems Research.
For primary bibliographic entry see Field 05B.
W74-00954

METHOD AND MEANS FOR ABSORBING CRUDE OIL AND THE LIKE FOR TRANSPORTATION AND RECOVERY,
Grantley Co., Jefferson, Ohio. (Assignee)
J. Weinberg.
U.S. Patent No. 3,756,948, 3p, 6 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 281, September 4, 1973.

Descriptors: *Patents, *Oil spills, Water pollution sources, Treatment, *Absorption, Plastics, *Pollution abatement, Water pollution control.
Identifiers: Polystyrene.

The material used is a foamed polystyrene plastic which is of closed cell-type, made by inflating cells of polystyrene with air. The foam has a density between 1.4 and about 2.0 pounds per cubic foot and an average cell size between about 1.0 mm and 3.0 mm, and absorbs about nineteen times its weight of crude oil. It has a selective absorption for oil when subjected to a mix of oil plus water, and does not soil upon contact after absorbing a saturated load of crude oil out of a bath of water. The absorbent foam is prepared by shredding to open up the cells for better oil absorption. Crumbs of the foam are spread upon the oil layer where they become saturated with about nineteen times their own weight in crude oil within about one minute. In addition to being used for cleaning up oil spills on a body of water, it might be used to clean up a sandy beach polluted by crude oil, and to absorb crude oil at a well head leakage. (Sinha-OEIS)
W74-00959

OIL SKIMMER MODULE,
Crisafulli Pump Co., Inc., Glendive, Mont.
A. J. Crisafulli.
U.S. Patent No. 3,756,414, 3p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 155, September 4, 1973.

Descriptors: *Patents, *Oil spills, Water pollution sources, *Skimming, Water pollution control, *Pollution abatement.

The skimmer module is adapted to be mounted in front of a floating barge or other vessel for removing the surface layer from body of water when the surface contains oil or other pollutants. The module has an open front receptacle with a horizontally inclined edge defining a weir that is able to be raised or lowered for varying the depth of the weir in relation to the surface of the body of water. Each module has a pump for removing water and pollutants collected in the receptacle and discharging them into a storage area. (Sinha-OEIS)
W74-00961

WATER DISPOSAL CAISSON AND METHOD OF USING SAME,
C. J. Carmichael, and A. G. Franklin.
U.S. Patent No. 3,756,409, 3p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 154, September 4, 1973.

Descriptors: *Patents, *Oil pollution, Water pollution sources, *Waste water disposal, Separation techniques, Water pollution control, Pollution abatement.

An offshore water disposal caisson for separating oil from waste water comprises the following parts: An outer caisson with an open bottom for communicating with the body of water; an oil collection tube having a closed bottom and a side wall oil filling opening through which oil is introduced proximate its upper end, the tube being of a diameter less than that of the outer caisson within which it is set; a waste water introduction tube for introducing the waste water below the oil-water interface within the caisson; and a pump to pump oil from the collecting tube as it approaches the tube's total capacity. (Sinha-OEIS)
W74-00963

SELF-RIGHTING FLOATING BOOMS,
M. F. Smith, and A. V. Anusuckas.
U.S. Patent No. 3,756,031, 7p, 13 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 914, No 1, p 58, September 4, 1973.

Descriptors: *Patents, *Oil spills, Water pollution sources, Floats, Equipment, *Pollution abatement, Water pollution control.
Identifiers: *Oil booms.

A self-righting floating boom is constructed by mounting on a vinyl fin several polymer floats. The polymer float is rectangular in shape with a shelf-like portion extending laterally from the flat side surface of the float and running the length of the float, with its ends being 'raked', to reduce drag during rapid endwise deployment. The shelf-like portion extends a distance at least equal to the float thickness and is positioned along the lower half of the float height. The bottom surface of the shelf-like extension of the float incorporates sloped surfaces along its terminating ends. This provides a lifting surface causing each float to skim or 'plane' on its shelf during end-wise deployment and eliminates any submergence tendency during endwise towing. (Sinha-OEIS)
W74-00965

APPARATUS AND METHOD FOR COLLECTION OF OIL FROM SURFACE OF THE SEA,
S. M. Verdin.

U.S. Patent No. 3,754,653, 4p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1140, August 28, 1973.

Descriptors: *Patents, *Oil spills, Water pollution sources, Pollution, *Separation techniques, Equipment, *Pollution abatement.
Identifiers: *Oil scoops.

Oil is removed from the surface of water in the presence of waves by mechanically scooping in large quantities of oil-contaminated surface water. The oily water is guided directly to the separation tank. The oil-rich phase may be passed over a weir into a storage compartment before it is directed into a separation tank. The scoop is disposed in the sea with its sidewalls extending down into the water and projecting above the surface of the water. The correct elevation of the scoop structure relative to the sea is maintained by means of ballast tanks. (Sinha-OEIS)
W74-00968

HEALTH ASPECTS OF FISH PRODUCTS FROM POLLUTED WATER,
For primary bibliographic entry see Field 05C.
W74-00979

PRELIMINARY RESULTS OF THE PROJECT FOR CONTROLLING AND PREVENTING SCHISTOSOMIASIS IN THE LOWER MAN-GOKY (MALAGASY REPUBLIC),
Institut Tropical Suisse, Basel.
For primary bibliographic entry see Field 05F.
W74-00992

EFFECT OF FISH ON THE BOTTOM OF RESERVOIRS,
For primary bibliographic entry see Field 02H.
W74-01020

LOUISIANA GOVERNMENT AND THE COASTAL ZONE-1972,
For primary bibliographic entry see Field 06E.
W74-01028

(THE POTOMAC 1972).
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 06B.
W74-01032

WETLANDS '73: TOWARD COASTAL ZONE MANAGEMENT IN LOUISIANA.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 02L.
W74-01043

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

A METHODOLOGY FOR ASSESSMENT OF WATER RESOURCES DEVELOPMENT: A COMPETITIVE EVALUATION MODEL FOR WATER RESOURCES DEVELOPMENT PLANNING,
Oklahoma Univ., Norman. Bureau of Water Resources Research.
For primary bibliographic entry see Field 06B.
W74-00559

DEVELOPMENT OF A DYNAMIC WATER MANAGEMENT POLICY FOR TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
W. L. Meier, J. C. Helm, and G. L. Curry.

Available from the National Technical Information Service as PB-224 844, \$5.50 in paper copy, \$1.45 in microfiche. Completion Report No. 52, June 1973. 215 p, 8 fig, 13 tab, 99 ref, 2 append.

Descriptors: Water resources, *Long-term planning, Reservoir operation, *Multiple-purpose reservoirs, *Linear programming, *Stochastic

WATER RESOURCES PLANNING—Field 06

Techniques of Planning—Group 6A

processes, Model studies, *Storage capacity, Expansion, Optimization, Evaluation, Construction, Timing, Scheduling, Water management (Applied), Project planning, Systems analysis, *Textures.

Identifiers: *Cost minimization, Operating policy, Change constraints, Integer programming, Bender's decomposition technique, Continuity equation, Hydrologic uncertainty, Economic uncertainty.

Optimization techniques are developed to assist in the implementation of long-range water resource plans. A stochastic programming formulation for obtaining an operating policy for single, multi-purpose reservoirs based on the continuity equation, stochastic inflow and demand, and chance constraints is developed. The chance constraints are converted to an equivalent linear deterministic set of constraints by a material balance equation. The formulation is then extended to a linked, multiple-purpose reservoir system. Both linear and quadratic objective functions are used with the equivalent linear constraint set. The problem addressed is to select reservoir storage capacities, schedule construction timing, and establish an operating policy which minimizes the total cost of a linked system of multi-purpose reservoirs. This mixed integer-continuous linear programming problem is separated into a linear programming problem and an integer programming problem using Bender's decomposition technique. The methodology is applied to Cypress Creek Basin in northeastern Texas. (Bell-Cornell) W74-00562

ALGORITHM FOR SOLVING A CLASS OF LINEAR PROGRAMMING PROBLEMS RELATED TO RESERVOIR MANAGEMENT AND DESIGN,
Universidad Nacional del Sur, Bahia Blanca (Argentina).
For primary bibliographic entry see Field 04A.
W74-00667

OPTIMIZATION MODEL FOR THE OPERATION OF FLOOD CONTROL SYSTEMS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W74-00668

WHEAT RESPONSE TO SOIL MOISTURE AND THE OPTIMAL IRRIGATION POLICY UNDER CONDITIONS OF UNSTABLE RAINFALL,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 03F.
W74-00669

LEAST-COST ALLOCATION AND VALUATION MODEL FOR WATER RESOURCES,
city Univ. of New York. Dept. of Mathematics.
For primary bibliographic entry see Field 05D.
W74-00670

PATHOLOGY OF A DYNAMIC PROGRAMMING SEQUENCING ALGORITHM,
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
T. L. Morin.
Water Resources Research, Vol 9, No 5, p 1178-1185, October 1973. 1 fig, 3 tab, 16 ref.

Descriptors: *Dynamic programming, *Algorithms, *Sequencing, Water resources development, Capital, Investment, Planning, Mathematical models, Systems analysis.
Identifiers: *Nonoptimality, *Capacity expansion, *Imbedded state space approach.

Two cases in which a conventional dynamic programming algorithm may produce nonoptimal

solutions to an important class of sequencing problems encountered in water resources development are identified. The pathological behavior of the conventional dynamic programming algorithm is analyzed and illustrated with a counterexample. The use of the imbedded state space approach in the determination of optimal solutions in the two cases is discussed and illustrated by solution of the counterexample. Extension of the imbedded state approach to the solution of more general selection and scheduling problems is also discussed. In the case of capacity expansion sequencing and scheduling, seemingly straightforward applications of dynamic programming fail because they overlook the combinatorial nature of such problems. The imbedded state space approach actually exploits the combinatorial nature of the expansion problems, thus guaranteeing that the optimal solution will always be found. (Bell-Cornell) W74-00671

CAPACITY DECISIONS IN A MULTIPURPOSE MULTIRESERVOIR SYSTEM,
Montana State Univ., Bozeman. Dept. of Industrial and Management Engineering.
For primary bibliographic entry see Field 04A.
W74-00672

DETERMINATION OF THE DISCHARGE POLICY FOR EXISTING RESERVOIR NETWORKS UNDER DIFFERING OBJECTIVES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W74-00673

MARKET PROBLEMS IN THE DISTRIBUTION OF EMISSION RIGHTS,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W74-00674

AN EVALUATION OF THE WATER-RELATED ECONOMIC RESOURCE DEVELOPMENT OF APPALACHIA-IN-MISSISSIPPI,
Mississippi Research and Development Center, Jackson.

T. A. Herrin.
Tombigbee River Valley Water Management District, Tupelo, Mississippi, December, 1967. 234 p, 22 fig, 76 tab, 3 append.

Descriptors: *Water resources development, *Regional development, *Economic impact, *Comprehensive planning, Mississippi, Appalachian Mountain Region, Costs, Benefits, Wages, Regional economics.

Identifiers: *Tennessee - Tombigbee Waterway.

The proposed development of the Tennessee-Tombigbee Waterway is expected to have a major influence on the economic development of the 20-country Appalachia area in northeastern Mississippi. This area, like all other Appalachian areas, lags the nation in economic development and in educational and health facilities. Recognizing this and to promote economic development, the U.S. Congress directed the Secretary of the Army to prepare a comprehensive plan for the development and efficient utilization of water resources in Appalachia. This study evaluates the economic framework of the Mississippi Appalachia area and estimates the impact of the proposed Tennessee-Tombigbee Waterway project on the area's economy. In 1960, the area's population was 406,187. It is estimated to grow to 1,392,000 by 2020, based on employment expansion from 134,040 to 500,000. Per-capita income is expected to rise from \$940 to 6,310. The Tennessee-Tombigbee Waterway project is estimated to cost \$325 million, with an annual cost of \$16.9 million over a 50-year life. Annual benefits are estimated to average \$521 million

of which \$496 million is attributed to payroll benefits resulting from economic growth. (Poertner)
W74-00799

RECREATION/TOURISM DEVELOPMENT PROGRAM FOR THE MISSISSIPPI APPALACHIAN AREA.
Noblitt Research, Jackson, Miss.

Mississippi Research and Development Center, Jackson, Mississippi, June, 1970. 113 p, 12 fig, 8 tab.

Descriptors: *Water resources development, *Recreational development, *Recreation demand, *Economic impact, *Appalachian mountain region, Mississippi, Comprehensive planning, Tourism, Recreation facilities, Economics.

The economic development of the Tombigbee River Valley Water Management District is dependent on the development of recreational facilities and water resources. The development of water resources will stimulate the development of recreation and tourism in the area. This study was undertaken to identify existing recreational facilities and suggest future facilities for fulfilling the recreational needs of area residents and tourists. The area involved is in the northeastern section of Mississippi and includes 20 counties. The area falls under the jurisdiction of the federal Appalachian Regional Development Act, which directs the Secretary of the Army to prepare a comprehensive plan for the development and efficient utilization of water and related resources of the area for improving the economic conditions. A program for the development of recreational facilities and tourist attractions was estimated to cost \$206.1 million in new capital investment. Income generated would be \$442.6 million and 17700 jobs would be created. It was suggested that historic sites be developed as well as a major attraction comparable to Disneyland. (Poertner) W74-00800

OPEN SPACE AND RECREATION PLAN.
Coastal Area Planning and Development Commission, Brunswick, Ga.

Prepared for the Department of Industry and Trade, Atlanta, Georgia, May, 1973. 119 p, 13 fig, 12 tab, 7 ref. HUD CPA-GA-04-04-1002.

Descriptors: *Water resources development, *Comprehensive planning, *Recreation demand, *Recreation facilities, Georgia, Data collections, Water sports, Water resources, Natural resources, Water resources development.

Open space and recreational facilities were studied as part of a comprehensive development plan. The area involved includes 8 counties in southeastern Georgia, bordered by Florida to the south and South Carolina to the north. It is predominantly rural and comprises a total area of 3,775 square miles and a population of about 300,000. The region has a diversified industrial base and many natural resources including an abundance of wildlife, a variety of vegetation and many rivers and marshlands. The existing features of the area are inventoried in this study and projected needs are estimated for the period 1973 to 1991. During these years, the population is expected to double and provision for facility use by persons outside the area must be taken into consideration. The area has many attractions of historic interest. It is recommended that: local governments set aside a minimum of 10 acres of open space and recreational land per 1000 people, that professional recreation-management personnel be hired in each county, and that private enterprise be encouraged to supply recreational facilities. (Poertner) W74-00801

Field 06—WATER RESOURCES PLANNING

Group 6A—Techniques of Planning

PROGRESS REPORT ON THE PROPOSED YELLOW CREEK PORT PROJECT TISHOMINGO COUNTY, MISSISSIPPI.

Tombigbee River Valley Water Management District, Tupelo, Miss.

January 23, 1969. 98 p, 3 fig, 4 tab.

Descriptors: *Regional development, *Water resources development, *Harbors, *Economic feasibility, Economic impact, Economics, Mississippi, Regional economics, Planning, Transportation, Ships.

Identifiers: *Yellow Creek (Mississippi).

A port in the northeast corner of the State of Mississippi would greatly improve economic conditions and has been a topic of discussion for many years. A feasibility study completed in 1967 showed that 13 countries would benefit from port development on Yellow Creek in Tishomingo County. It is estimated that direct benefits to existing firms would be about \$1.4 million over the life of the port. In addition, new firms would be attracted to the area, providing new jobs and an increased tax base also, freight rates for rail transportation would probably decrease from the competition between railroads and water transport companies. Total benefits are estimated at over \$44.6 million, with a project benefit-cost ratio of 6.07. Because of the attractiveness of this project, local legislators encouraged state-enabling legislation, which was adopted. The legislation established the governing structure for the project. Several counties fulfilled these requirements and the project has progressed closer to reality, although action has not progressed beyond the planning stage. (Poertner)

W74-00804

COMPREHENSIVE WATER AND SEWERAGE PLAN FOR OUACHITA PARISH.

Sample, Jenkins and Madden, Monroe, La.

The Ouachita Council of Governments, Monroe, Louisiana, 1973. 76 p, 5 fig, 14 tab, 13 ref. HUD LAO6-48-1010.

Descriptors: *Comprehensive planning, *Water supply, *Sewerage, Storm drains, Louisiana, Water resources development, Costs, Construction costs, Planning, Data collections, Waste water treatment.

Identifiers: *Ouachita Parish (Louisiana).

A comprehensive plan for water and sewerage was prepared for the Ouachita Parish, Louisiana. Existing water, sewer and storm drainage systems were inventoried. Design criteria were described, and a plan was established for improvement of the existing system. Seventy-two public water systems (each serving more than 10 people) were campgrounds, etc. These systems pose problems of monitoring of health standards. Water is taken from both ground and surface supplies, and all but one system violates one or more Public Health Service standards (usually color). Sewage treatment is often accomplished with the use of oxidation ponds, a favorable arrangement where land is inexpensive. There are many small systems which pose monitoring problems for the health department. The major system in the City of Monroe is also threatened by structural failure of a sewer main, plant overloads, odors, and corrosive action by hydrogen sulfide. Storm drainage appears to be adequate in the parish. In some areas, open channels are used and periodic cleaning is required to maintain the channel capacity. Based on an increase in population from 97,500 in 1970 to an ultimate population of 250,925, detailed projects are cost-estimated with a list of 18 priority projects. (Poertner)

W74-00806

ADDITIONAL SOURCES FOR WATER SUPPLY FOR THE TOWN OF WELLESLEY.

Coffin and Richardson, Inc., Boston, Mass.

Board of Public Works, Wellesley, Massachusetts, October 18, 1966. 31 p, 2 fig, 3 tab, 3 append.

Descriptors: *Water resources development, *Forecasting, *Planning, *Water demand, Water supply, Massachusetts, Water requirements, Dependable supply, Water shortage, Imported water, Political aspects, Institutions, Urbanization, Water contracts.

Identifiers: *Wellesley (Massachusetts), *Boston (Massachusetts).

The Town of Wellesley, Massachusetts, located within 10 miles of Boston, is faced with an impending water shortage. The town had a 1966 population of about 27,000 and is expected to grow to a population equivalent of about 36,600 by the year 2000. Water consumption per person is also expected to increase, and total water consumption is expected to increase from the 1965 level of 3.10 mgd average (7.64 mgd maximum) to about 5.9 mgd average (18.0 mgd maximum) in year 2000. Six wells, that serve the town have a combined available water quantity of less than 7.7 mgd for extended periods of time. Alternatives include joining the Metropolitan District Commission (MDC) of Boston and developing additional groundwater supplies. Joining the MDC would require the expenditure of from \$1.19 to \$1.34 million and the purchase of land and rights-of-way. The Town of Wellesley would also be obligated to purchase a minimum of one-third of their water from the MDC at the rate of \$120 per million gallons. Groundwater supplies furnishing 10 mgd could be developed for a total of \$737,000 excluding land and rights-of-way. One problem which must be settled is a state law which prevents any town within a 10-mile radius of the State House (which includes Wallesley) from developing new supplies—they are obligated to join the MDC. It is debatable whether this water source is a new supply or part of the supply already tapped by other wells. (Poertner)

W74-00807

FINDINGS OF THE NATIONAL WATER COMMISSION,

National Water Commission, Arlington, Va.

T. M. Schad.

Paper presented at the American Society of Civil Engineers, National Water Resources Engineering Conference, Washington, D. C., January 29-February 2, 1973. 11 p.

Descriptors: *Comprehensive planning, *Water requirements, *National Water Commission, *Water resources development, Forecasting, Planning, Water allocation (Policy), United States, Alternative planning.

The National Water Commission recently completed an 1100-page report including many recommendations for future water development in the United States. Two general recommendations are: (1) that the country should plan for future water use in terms of alternative futures rather than to project past trends indefinitely into the future, and (2) that the nation's water institutions are recognized to be experiencing a 'cultural lag' in that past programs have not been evaluated in terms of present requirements, but have been followed blindly. A major recommendation is that the beneficiaries of water resource development, and not the general taxpayer, pay the cost of such development. Water planning should not be an end in itself. It should be an adjunct to land use planning. Water quality planning must go hand-in-hand with water quantity planning. Over 208 specific recommendations were presented in the report. (Poertner)

W74-00812

PHASE I COMPREHENSIVE WATER AND SEWER PLAN.

Mid-Missouri Regional Planning Commission, Jefferson City.

September, 1971. 114 p, 18 fig, 43 tab.

Descriptors: *Comprehensive planning, *Data collections, *Natural resources, Missouri, Evaluation, Agriculture, Water resources, Population, Facilities.

The development of a comprehensive water and sewer plan for the Mid-Missouri Regional Planning Commission requires that an inventory of existing conditions first be prepared. The region includes 8 counties with a 1970 population of about 225,000 which is expected to grow to about 279,000 by 1990. The area has been—and will continue for some time to be—agricultural in nature. However, farm employment and population has declined sharply as the result of farm consolidation and mechanization. Average family income is \$4,304 compared to the St. Louis average of \$7,527. A complete inventory was made of the following: (1) economic conditions; (2) natural resources, including minerals, timber, agriculture, water, and soil type; and (3) community and transportation facilities. The area relies on both groundwater and surface water and both seem to be in good supply. Communities most often rely on groundwater for municipal supplies. Only 6 communities rely on surface water from the Missouri River or other impoundments. Groundwater is generally hard. (Poertner)

W74-00813

OPTIMAL ALLOCATION OF ARTIFICIAL AERATION ALONG A POLLUTED STREAM USING DYNAMIC PROGRAMMING,

California Univ., Los Angeles. Dept. of Engineering Systems.

For primary bibliographic entry see Field 05G.

W74-00883

SUBJECTIVE DECISION-MAKING FOR URBAN WATER RESOURCES DEVELOPMENT,

Rockwell International Corp., Anaheim, Calif.

For primary bibliographic entry see Field 06B.

W74-00884

SCIENTIFIC ALLOCATION OF WATER RESOURCES, WATER RESOURCES DEVELOPMENT AND UTILIZATION - A RATIONAL APPROACH,

Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.

N. Buras.

Environmental Sciences Series, American Elsevier Publishing Company, Inc., New York, N.Y. 1972. Asit K. Biswas, Editor. 197 p, 38 fig, 2 tab, 260 ref.

Descriptors: Water resources, Engineering, *Water quality, *Water quantity, *Dynamic programming, *Linear programming, *Simulation analysis, *Stochastic processes, Optimization, Water utilization, Design, Operation and maintenance, Water resources development, Operations research, Mathematical models, *Water allocation (Policy).

The state-of-the-art of water resources engineering is surveyed, embracing a broad spectrum of issues: quantity aspects as well as quality aspects within a systems approach. The field of water resources engineering is defined, emphasizing its natural and social sciences components. The systems approach to water resources problems is described and illustrated in the context of the design and operation of water systems. Then, three broad categories of water engineering are identified and discussed: Development, design, and operation problems. The remainder, and

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greater part, of the book explores operations research methods used in solving such problems. Discussed are: (1) probability techniques and their application to water storage problems; (2) linear programming applications to water quality management, reservoir operation and design, and aquifer management; (3) basic ideas of dynamic programming, the method best suited to sequential decision processes; (4) applications of dynamic programming to derive optimal operating procedures for a variety of systems, from relatively simple ones to complex systems involving multiple purposes, many structures, and surface and ground water; and finally (5) simulation techniques, including the methods of synthetic hydrology and Monte Carlo. (Bell-Cornell) W74-00885

NONLINEAR EFFLUENT CHARGES,
California Univ., Riverside.
For primary bibliographic entry see Field 05G.
W74-00886

SYSTEMS ENGINEERING APPROACH,
Texas Water Development Board, Austin.
Systems Engineering Div.
A. O. Weiss.
Water for Texas, Vol 2, No 1, p 3-9, October,
1971. 5 fig.

Descriptors: *Mathematical models, *Analytical techniques, *Computer models, Computers, Model studies, Research and development, Technology, *Synthetic hydrology, *Water management (Applied), Routing, Water resources, Water supply.
Identifiers: Hydrologic analysis, *Systems engineering.

The Systems Engineering Approach is more than a set of computerized modeling capabilities. It is a philosophy of analysis and problem solving which with the aid of computers evaluates complex systems. The Systems Engineering Approach can be used to help planners in their effort to consider the myriad hydrological, physical, economic, environmental and social aspects involved in water resources development in a comprehensive and systematic manner. The systems modeling capabilities are not designed to provide a detailed quantitative solution to every problem, nor do they represent an exact simulation of the prototype. They represent a set of mathematical techniques that approximate the prototype at various degrees of fidelity and provide information at varying levels of accuracy, in a manner helpful to the evaluation of and selection between viable alternatives. Equipment models used by the Texas Water Development Board in its regional water resources management programs are discussed. (Hunt-NWWA)
W74-00940

OPTIMIZATION OF SURFACE-WATER QUALITY: A PROPOSAL FOR SOLVING A FUTURE PROBLEM (IN GERMAN),
Frankfurt Univ. (West Germany). Hygiene-Institut.
For primary bibliographic entry see Field 05B.
W74-00994

IN SEARCH OF NEW METHODS FOR RIVER SYSTEM PLANNING,
Harvard Univ., Cambridge, Mass. Graduate School of Public Administration.
For primary bibliographic entry see Field 04A.
W74-01029

THE HARVARD PROGRAM: A SUMMING UP,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 06B.
W74-01030

6B. Evaluation Process

WILD RIVER PERCEPTION AND MANAGEMENT: A STUDY OF USERS AND MANAGERS OF THE MIDDLE FORK OF THE SALMON RIVER,

Idaho Univ., Moscow. Dept. of Agricultural and Forest Economics.
R. L. Peckfelder.

Available from the National Technical Information Service as PB-224 832, \$4.25 in paper copy, \$1.45 in microfiche. M.S. Thesis in Forest Recreation, Idaho Water Resources Research Institute, Moscow, Scenic Rivers Study, N.Y. August 1973. 108 p, 1 fig, 37 tab, 24 ref, append. OWRR C-3342-(3718) (2).

Descriptors: *Idaho, *Forest management, *Wild rivers, *Attitudes, Water users, *Census, *Recreation, Fishing.
Identifiers: *Salmon River (Idaho).

Evidence indicates that foresters who manage the Middle Fork of the Salmon River are very much in tune with floaters in their personal outlook on river management; they correctly predicted user reaction to more than fourtenth of the questionnaire statements presented in this study. Questionnaires from 253 of 367 floaters and all Forest Service personnel were returned. Eighty percent of the statements were correctly perceived by managers. Forest Service personnel, however, did not accurately perceive many of the characteristics of users. Managers did not feel as strongly about environmental issues as did users. Users responded more intensely than managers to the importance of Solitude in the wild river experience. Managers appeared to be more development-oriented than did users. Forest Service personnel stressed stronger feeling toward the need for controls on the Middle Fork than did users. The responses to management alternatives were not generally perceived by managers. Middle Fork managers appear to be similar in their responses to those of users which indicates knowledge of the Middle Fork user. Needs include (1) additional information on all factors that may be a result of increasing use, (2) establishing guidelines that will determine when the maximum number of people is attained and controls imposed to correct it, and (3) continual information flow from users.
W74-00551

SUBURBAN AMERICA: POPULATION DYNAMICS AS RELATED TO WATER RESOURCES PLANNING,

Wapora, Inc., Washington, D.C.

B. Wachter, B. Baratz, and G. Beeland.

Available from the National Technical Information Service as PB-225 050/4, \$4.75 in paper copy, \$1.45 in microfiche. Completion Report, October, 1973. 143 p, 10 fig, 11 tab, 65 ref, 5 append. OWRR C-3384 (3740) (1).

Descriptors: *Census, *City planning, *Decision making, Land development, Local governments, *Long-term planning, Municipal wastes, Municipal water, Project planning, Public benefits, Erosion control, Sediment control, Soil erosion, *Urbanization, Water management (Applied), Zoning, Human population, Land use, Relocation, District of Columbia.
Identifiers: Transportation planning, *Suburban development.

In the past decade, suburban living has rapidly attracted a major fraction of the American population. The current study investigated the degree to which water resources planning was incorporated into the suburbanization phenomenon. To meet this end, personnel of county governments, regional planning commissions, water and sewage agencies, developers etc. were solicited for their appropriate data and experiences. A broad nationwide questionnaire survey was performed to develop an overall view of the problem and the

solution approaches (if any) that were taken. Also, extensive personal interviews were conducted in Metropolitan Washington, D.C. with responsible officials active and/or knowledgeable in the subject area. The results of the questionnaire and Metro Washington, D.C. surveys indicated several, important areas for consideration. Specifically, the factors of soil condition, transportation planning, industrial relocation, and overlapping of local government interests, all influenced suburban development patterns. These factors were then examined in depth by personal interviews at the following major metropolitan areas: Cleveland, Ohio, Milwaukee, Wis., Houston, Texas, Pittsburgh, Penn. All of the above efforts resulted in a series of guidelines for water resources planning in suburban areas. These guidelines were designed to provide a useful framework for those engineers and urban designers who are engaged in the future plans for suburban America.
W74-00553

SOCIAL AND CULTURAL IMPACT OF A PROPOSED RESERVOIR ON A RURAL KENTUCKY SCHOOL DISTRICT,

Kentucky Water Resources Inst., Lexington.

C. R. Smith, and P. Drucker.

Available from the National Technical Information Service as PB-224 833, \$5.25 in paper copy, \$1.45 in microfiche. Research Report No. 60, 1973. 180 p, 23 tab, 6 ref, 2 append. OWRR B-027-KY (1). 14-31-0001-3595.

Descriptors: *Attitudes, Education, Social aspects, *Social change, Social function, *Social impact, Social values, *Kentucky, *Urbanization, Pre-impoundment, Multiple-purpose reservoirs, *Rural sociology, Area redevelopment.
Identifiers: Anthropological concepts, Cultural change, *Cultural values, Urban intrusion.

This study uses anthropological concepts and research methods to study attitudes toward education and the educational system of a central Kentucky school district with the goal of predicting the impact on it of proposed multi-purpose (flood-control, recreation, etc.) reservoir, and of proposing options for forestalling dysfunctional social aspects of that impact. The social impact will result from the fact that although the county is now rural oriented, the proposed reservoir will attract (has already begun to attract) urbanite residents from Louisville, Kentucky's largest city, who can be expected to bring urban values concerning education, as well as other urban social values. Massive social change and cultural change can be anticipated. To assess probable directions of change in education, a school in an upper middle class suburb in Louisville, the sort of milieu from which most of the urban intrusion will come, was also studied. This research is another step in the study of changing social function, and changing cultural values in general, in the program, 'Anthropological analysis of sociocultural benefits and costs from stream-control devices.' (Grieves-Kentucky)
W74-00557

IMPACT OF A PROPOSED RESERVOIR ON LOCAL LAND VALUES, ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES - PHASE 3,

Kentucky Research Inst., Lexington. Water Resources.

P. Drucker, C. R. Smith, and A. C. Turner.

Available from the National Technical Information Service as PB-224 982/9, \$4.25 in paper copy, \$1.45 in microfiche. Research Report No. 51, 1972. 101 p, 12 map, 4 tab, 8 ref, append. OWRR A-031-KY (1). 14-31-0001-3217.

Descriptors: *Rural sociology, Multiple-purpose reservoir, *Land appraisals, Pre-impoundment,

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*Kentucky, *Attitudes, Condemnation, Real property, *Regression analysis, *Relocation, Rural areas, Social change, Social impact, *Social values, *Urbanization, *Benefits, Area redevelopment, Costs.
Identifiers: Anthropological concepts, Anxiety patterns, Dislocation of persons.

This project was designed to study the social impact and economic impact of private pre-construction acquisition of real property in a Central Kentucky rural area in which a multi-purpose dam is planned. The research design was built around use of anthropological concepts and research techniques. By these means it was possible to analyze the attitudes toward, and social values of land to traditionalist residents, among which social and economic security concepts are paramount. Recent land purchases locally believed to have been made for speculative purposes by 'outsiders,' (urbanites from Louisville, Ky.), at prices out of line in terms of local agricultural worth, have been extremely unsettling, contributing to the anxiety patterns typical of persons facing forced relocation by sale or condemnation. A newly developing pattern of land purchase, with values related to residential convenience and access to the urban center, rather than to traditional agricultural criteria, is identified through regression analysis. Social change manifested in a partial urbanization is evident among a segment of the local population who try to take advantage of urban economic opportunities while participating in rural society and activities. (Grieves-Kentucky) W74-00558

A METHODOLOGY FOR ASSESSMENT OF WATER RESOURCES DEVELOPMENT: A COMPETITIVE EVALUATION MODEL FOR WATER RESOURCES DEVELOPMENT PLANNING, Oklahoma Univ., Norman. Bureau of Water Resources Research.

G. W. Reid, and S. Y. Law.

Available from the National Technical Information Service as PB-224 825, \$5.50 in paper copy, \$1.45 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, July 1973. 186 p, 20 fig, 44 tab, 30 ref. OWRR A-036-OKLA (1). 14-31-0001-3836.

Descriptors: *Water Resources Development, Evaluation, Planning, *Benefits, *Decision making, Priorities, Regional analysis, Methodology, System analysis, Measurement, Cost-benefit analysis, River basins, Model studies.

Identifiers: *Competitive evaluation, *Cost-effectiveness analysis, *Game theory, Decision theory, Heuristic gaming, Strategies, Weighting factor, Utility numbers, Expected value.

The purpose was to develop an effective evaluation methodology for assisting in water resources development planning. A new model was contemplated for solving two principal problems associated with the present practices of water resources development planning - the considering of individual development as isolated entity and the using of the benefit and cost ratio as the only analysis in the evaluation process. The model was developed by using game theory concepts. The principal tactics employed in the model are the competitive measuring between benefit categories and the competitive evaluation of the development objectives. The procedure used in the model enables the identifying of the following: the overall system of water resources development as well as the individual or local development, the relationship and priorities of developments in different locations and between various purposes of development. The model is also able to recognize the competitive nature of water resources development and to augment some new measurements. The model as a whole provides a new approach for summarizing a large number of data into a simple and meaningful form in order to formulate systematic recommendations for the decision-maker.

W74-00559

PROTECTING OUR WATER ENVIRONMENT. Denver Regional Council of Governments, Colo. For primary bibliographic entry see Field 05G. W74-00743

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1972. Honolulu Board of Water Supply, Hawaii.

1972. 24 P, 1 FIG, PHOTOS, 4 TAB.

Descriptors: *Water management (Applied), *Administration, *Financing, *Hawaii, Water supply, Coordination, Water analysis, Water delivery, Water distribution (Applied), Water policy, Water rates.

Identifiers: *Honolulu (Hawaii), Quality monitoring.

Projects in planning, resources, and research are discussed. Through negotiations with federal, state, and county agencies and private water users, rules and regulations were adopted for coordinated protection, development, and conservation of water resources. A program for tracing and dating groundwater is in progress. Contamination of water by organic chemicals, as judged by the amount of carbon extractable by chloroform, was negligible. Computer models have been developed to analyze water distribution systems. The Chemical Laboratory has conducted pollution studies, such as pesticide monitoring of sources, and water quality studies, including seepage investigations and system surveillance for water quality deterioration due to stagnation in water mains. Financial statements, as well as operation and pumping information are presented. (Hoffman-North Carolina) W74-00749

CORONADO RESOURCE CONSERVATION AND DEVELOPMENT PROJECT, PROGRAM OF ACTION. Soil Conservation Service, Phoenix, Ariz. For primary bibliographic entry see Field 04A. W74-00755

AN EVALUATION OF THE WATER-RELATED ECONOMIC RESOURCE DEVELOPMENT OF APPALACHIA-IN-MISSISSIPPI, Mississippi Research and Development Center, Jackson. For primary bibliographic entry see Field 06A. W74-00759

PROGRESS REPORT ON THE PROPOSED YELLOW CREEK PORT PROJECT TISHOMINGO COUNTY, MISSISSIPPI. Tombigbee River Valley Water Management District, Tupelo, Miss. For primary bibliographic entry see Field 06A. W74-00804

SUBJECTIVE DECISION-MAKING FOR URBAN WATER RESOURCES DEVELOPMENT, Rockwell International Corp., Anaheim, Calif. J. H. Dean, and C. S. Shih. Water Resources Bulletin, American Water Resources Association, Vol 9, No 5, p 942-949, October 1973. 3 fig, 9 ref.

Descriptors: Water resources development, *Decision making, *Alternative planning, *Municipal water, *Water supply, Waste water treatment, Dams, Optimization, Engineering, Costs, Water quality, Water quantity, Systems analysis.
Identifiers: *Bayesian decision theory, *San Angelo (Texas), Delphi method, Utility theory,

Probability assessments, Public response, Sensitivity analysis, Uncertainty.

The soliciting of expert and general public opinion is indispensable in making choices for the welfare of the general public from alternative courses of action under uncertainty. Bayesian decision theory is utilized to consider engineering alternatives, quality, quantity, cost, and the intangible public response for the selection of optimal strategies in urban water resources development. This approach is capable of incorporating seemingly unquantifiable, abstract factors into the decision-making process. It is a systematic solution procedure used to identify and rank the best alternatives in accordance with the quantitative assessments. The basic elements of the method-decision flow diagrams, judgmental probability assessment, and utility theory—are discussed and illustrated. The analysis is applied to the city of San Angelo in central Texas where alternatives for supplementing a dwindling water supply are being considered: Groundwater development; a waste treatment plant capable of producing potable water; and the building of an additional dam. Use of the Delphi method—an iterative questionnaire technique featuring anonymity, iteration with feedback, and statistical group response—is described. (Bell-Cornell)
W74-00884

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX A—THE PEOPLE AND THE ECONOMY. Corps of Engineers, Baltimore, Md. For primary bibliographic entry see Field 02L. W74-00887

IN SEARCH OF NEW METHODS FOR RIVER SYSTEM PLANNING, Harvard Univ., Cambridge, Mass. Graduate School of Public Administration. For primary bibliographic entry see Field 04A. W74-01029

THE HARVARD PROGRAM: A SUMMING UP, North Carolina Univ., Chapel Hill. M. M. Hufschmidt. In: Water Research, Resources for the Future, Washington, D.C. 1966. A. V. Kneese and Smith, S. C. editors, p 441-455. 6 ref.

Descriptors: *Planning, *Water resources, *Analysis, Analytical techniques, *Decision-making, *Methodology.
Identifiers: System design, Basic research, Applied research, *Harvard Water Program.

Initial objectives of the Harvard Water Program for multidisciplinary research and advanced training for public servants in water resources planning and development, were to test the validity and utility of certain new methods and techniques of economic, engineering, and governmental analysis, with the problems of system design and operation related to broader economic data, overall engineering design and economic analysis, public policies, and legal and institutional factors affecting water resources development. Major research topics developed during Phase I included: the multiple-dimension nature of the social welfare function; the use of concepts of social rate of time discount and opportunity costs; structure of a public investment decision-model for water resources incorporating the notions of objective function, design criteria, cost-input functions, benefit-output functions, production functions and dynamic analysis; system planning techniques for simulation and mathematical models; and a normative model of political decision-making on public investment. Phase II involved testing of methodology and techniques on realistic planning cases, plus continuing basic research on (a) setting objectives and deriving and applying planning

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criteria for field-level planning; and (b) the process of field level planning, including techniques of analysis applicable to complex systems. Some conclusions are that continuity played a major role in the strength of the program, advanced computer technology aided analysis techniques, and university research groups function better on basic research problems than on problems of application. (Edwards-North Carolina)

W74-01030

(THE POTOMAC 1972).

Interstate Commission on the Potomac River Basin, Washington, D.C.

1972. 25 p, 7 fig, photos.

Descriptors: *Water quality, *Water supply, Pollution, *Inter-agency cooperation, *Potomac River, Maryland, Virginia, Pennsylvania, West Virginia, *District of Columbia, Waste water treatment, Flood control, Energy, Financing.

Identifiers: *Intergovernmental coordination, Interstate Commission on the Potomac River Basin (ICPRB), State planning, Washington Area Interstate Water Resources Program, Potomac River Basin Compact, *Washington, D.C.

With no operational, regulatory or enforcement authority, the impact of the Interstate Commission on the Potomac River Basin (ICPRB) is felt through providing liaison and assistance to public and private agencies, coordinating programs for use, conservation, and of development of water and land resources, and pollution control. In 1972 ICPRB requested designation by the federal government and the states of Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia as the official coordination agency for both water quality and water resources. The proposed Potomac River Basin Compact to develop water resources planning by a single comprehensive agency has not been approved by all the states. A task force from Md., Va., and D.C. recommended approaches for cleaning up the river and ensuring water supply for metropolitan Washington 'perhaps to the year 2000.' Proposals call for inter-connecting 3 major water supply systems, construction of Verona and Six Bridges Reservoirs, and development and expansion of water treatment and finishing water storage facilities. Advanced treatment of waste must be completed by all treatment plants in the area. Controlling discharges of raw sewage, construction of new treatment plants and implementation of a monitoring system are vital. Sediment problems, water quality, energy supply, B and O Canal, and 1972 Potomac Flood are also discussed. (Hufschmidt-North Carolina)

W74-01032

NORTH CAROLINA WATER PLAN-PROGRESS REPORT, CHAPTER 35-NEW RIVER BASIN.

Draft Progress Report March, 1970. 64 p, 22 tab, 32 ref, 1 append. WRC.

Descriptors: Water resource development, *Planning, *Project planning, *Research priorities, *North Carolina, Coordination, *River basin development.

Identifiers: *Federal-state coordination, *New River Basin (N.C.).

The New River Basin in North Carolina is the head of the New River watershed, a major tributary of the Kanawha River which flows into the Ohio River. Water resources in the Basin are presented, primarily in a tabular format. North Carolina's responses to the Ohio River Basin Comprehensive Survey Report, the Kanawha River Basin Comprehensive Study, and the procedure for the Appalachian Power Company license application to construct the Blue Ridge Hydro-Electric Project are evaluated. The recreation plan of the Blue

Ridge Project originally showed 3 park areas in North Carolina and several boat launching sites. However, according to North Carolina and Virginia, Department of Interior requirements for water quality storage would have destroyed the proposed recreational aspects. This generated a study by the Federal Power Commission, resulting in increasing the size of the reservoirs. Conclusions on water resource development were: (1) major structural projects in or affecting North Carolina will provide greater benefits of power generation, flood control, and low flow augmentation in states other than North Carolina, (2) some existing trout waters will be removed from classification by reservoir characteristics of major impoundments affecting North Carolina, (3) scenic and fishery characteristics need special efforts for preservation or enhancement, and (4) land and population resources are not favorable to either large or water-intensive industry. State and local planning efforts must recognize that the resource needs of the North Carolina portion of the New River Basin will probably be subordinate to larger regional requirements. (Hoffman-North Carolina)

W74-01033

WATER AND SEWER PLAN UPDATE, (GRAY, GEORGIA).

Middle Georgia Area Planning Commission, Macon.

For primary bibliographic entry see Field 05D. W74-01036

MASTER PLAN FOR MAJOR DRAINAGE: HENRY'S LAKE AREA, SUBBASIN 1-31-55-01-01.

Denver Regional Council of Governments, Colo.

Available from the National Technical Information Service as PB-218 959, \$3.00 in paper copy, \$1.45 in microfiche. Project REUSE Final Report (Supplement). October, 1971. 89 p, 19 fig, 14 tab. COLO-USE-1. DHUD-H-1392.

Descriptors: *River basin development, *Environmental engineering, *Regional analysis, *Colorado, *Planning, Runoff, Pollution, Drainage, Urban planning.

Identifiers: Major drainage, *Henry's Lake (Colo.), Master planning, *Urban systems engineering.

As the first application of the methodology, criteria, and existing situation description developed under Project REUSE (Renewing the Environment through Urban Systems Engineering), this report was designed to serve as a prototype and standard for future multi-jurisdictional preventive master planning in the Urban Drainage and Flood Control District. The systems engineering approach used is based on a functional description of the urban drainage system. Runoff analyses for existing and various possible future conditions defined the physical magnitude of the system requirements and established a frame of reference for selecting a major drainage concept. An Environmental Design Team reviewed significant problems encountered and assisted in analyzing and evaluating potential concepts. From this, a plan for major drainage was prepared that provides for effective functioning of the major drainage system and orderly development of the Henry's Lake area. Detailed master plan and implementation recommendation are included. The appendix summarizes Project REUSE mathematical models for urban drainage and flood control. (Hoffman-North Carolina)

W74-01037

ANALYSIS OF PORT DEVELOPMENT POTENTIALS AT GREAT SODUS BAY.

Genesee/Finger Lakes Regional Planning Board, Rochester, N.Y.

Descriptors: *Planning, *Harbors, Marinas, Great Lakes, *Lake Ontario, *New York, Recreation demand, Camping, Recreation facilities.

Identifiers: *Recreation development, Resorts, Development potential, *Great Sodus Bay (N.Y.).

Port development potentials of Sodus Bay, an enclosed and naturally protected harbor midway between Rochester and Oswego, New York on the south shore of Lake Ontario are assessed. Until 1967, the Pennsylvania Railroad operated a coal dock on an elevated deep-draft loading pier constructed of heavy creosoted timbers. Increased railroad price structures, a lack of coal storage facilities, and failure to improve harbor facilities gave a competitive advantage to Lake Erie ports. After studying the potential for revival of coal transhipment, the prognosis for revival is negative. With obsolescent facilities and the remoteness of Great Sodus Bay from urban centers, the future for any port facilities is dim. It is possible, but unlikely, that a large-scale bulk commodity-absorbing cement plant, steel mill, electrical power plant, or chemical plant might locate in the vicinity at a future time. Recreational potential for the area is more promising; demands are identified for 150 additional boat slips by 1975 and 330 by 1980, a resort-type lodge of 140 rooms in 1975 or 280 rooms by 1980, 70 to 90 transient housing units immediately, and 455 campsites by 1985. An antique railroad museum is a possibility for the old railroad yards. Land area requirements are projected for identified recreational needs. Intergovernmental coordination and cooperation are called for to promote recreational development. (Stein-North Carolina)

W74-01039

A SUMMARY REPORT MASTER WATER AND SEWERAGE PLAN.

CIM, Inc., San Luis Obispo, Calif.

For primary bibliographic entry see Field 05D. W74-01041

SEWERAGE MASTER PLAN, EUGENE-SPRINGFIELD URBANIZING AREA.

Edmundson, Kochendoerfer, and Kennedy, Portland, Oreg.; and Daniel, Mann, Johnson, and Menkenhall, Portland, Ore.

For primary bibliographic entry see Field 05D. W74-01042

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE-1970.

Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.

September, 1971. 129 p, 21 tab, 12 maps, 6 append.

Descriptors: *Water supply development, *Projections, *Sewerage, *Pennsylvania, Planning, Networks, Forecasting, Costs, Methodology.

Identifiers: *Priority evaluation, *Lehigh-Northampton Counties (Penn.), Expansion.

The purpose was to update the 1966 Plan and to develop a priority program for 1970-1980. Implementation of water supply facilities had been variable, with only Bethlehem and Easton Water Supply Systems following the 1966 Plan in both substance and timing. Plan revisions were based on new trends in existing water supply system expansion, new population and population density distribution projections, and the narrowed time focus of the update. Trexler Dam and Reservoir, with a new Lehigh Water Supply System as the primary user of this source of water, remained a major recommendation. Proposed expansion of Bethlehem Water Supply System was greater than originally recommended, with a 10.0 mgd. increase source main capacity deemed necessary. Several proposed rural systems were eliminated. All recommendations are tabulated. Including new construction and expansion, approximately 10% of the 1966 Plan recommendations for sewage

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

treatment facilities were carried out. The 1970 update recommends fewer and larger sewer treatment systems (21 instead of 24). Tables detail the present capacity of sewage treatment works, projected service area population and waste water volume, and recommended new construction, including costs. A numerical evaluation system for water and sewer projects was developed. Points were assigned to each project based on selected criteria. Tables list the rankings of each project, with the Eastern Part of Bethlehem Township ranking highest (88 out of a possible 100 points). (Hoffman-North Carolina) W74-01045

WATER-RELATED FACILITIES STUDY FOR THE COMPREHENSIVE REGIONAL PLAN OF COLUMBUS AND FRANKLIN COUNTY (OHIO).

Burgess and Niple, Ltd., Columbus, Ohio.

Prepared for Franklin County Regional Planning Commission, Columbus, Ohio. 1969. 137 p. Ohio P-46 (G) X-1105-2.

Descriptors: Planning, *Water supply, *Flood control, Sewerage, Drainage, Flood plains, Water demand, *Comprehensive planning, *Urbanization, Financing, Administration, *Ohio.
Identifiers: Flood Plain Management, Columbus (Ohio), Franklin County (Ohio).

This study focuses on the Columbus, Ohio metropolitan area which includes all of Franklin County plus parts of adjacent counties expected to be urbanized by 1985. The study is closely related to the metropolitan comprehensive planning program and covers water supply, flood control, sewerage, and drainage. The water supply plan emphasizes the full development of local sources of water before turning to major diversions, e.g. from the Ohio River. The flood control program consists of small reservoirs, channel maintenance, and flood plain management. Existing sanitary sewers are expected to be adequate through 1985, but the formulation of policy for future service extensions is important now. Thus, the sections on sewerage and drainage are policy-oriented and cover relations to urbanization and land use planning. A final section discusses financing and implementation of the plans and policies and recommends the creation of a single metropolitan wide agency with both administration and construction powers. (Elfers-North Carolina) W74-01048

CLASSIFICATION AND EVALUATION OF FRESHWATER WETLANDS AS WILDLIFE HABITAT IN THE GLACIATED NORTHEAST, Rhode Island Univ., Kingston. Dept. of Forest and Wildlife Management.

F. C. Golet.

In: Transactions of the Northeast Section, The Wildlife Society, Mt. Snow, Vermont, 1973. p 257-279, 5 fig, 2 tab, 22 ref. OWRR B-023-MASS (7). 14-31-0001-3596.

Descriptors: *Wetlands, *Wildlife habitats, *Classification, Evaluation, *Northeast U.S., *Massachusetts, Decision making, Vegetation.

A detailed classification system for freshwater wetlands is presented along with ten criteria for the evaluation of wetlands as wildlife habitat. The results are based on a two-year field study of over 150 wetlands located throughout the State of Massachusetts. The major components of the classification system include wetland classes and subclasses, based on the dominant life form of vegetation and surface water depth and permanence; size categories; topographic and hydrologic location; surrounding habitat types; proportions and interspersion of cover and water; and vegetative interspersion. These components are combined with wetland juxtaposition and water chemistry to

provide criteria for wetland evaluation. Using a system of specifications and ranks, wetlands can be arrayed according to their wildlife value for decision-making. (Larson-Massachusetts) W74-01052

DIFFERENTIAL REPRODUCTION AS A CRITERION FOR EVALUATING DEVELOPMENT DECISIONS,

Oregon State Univ. Corvallis.

C. L. Smith.

Human Organization, Vol 32, No 2, p 177-183, Summer 1973. 1 tab, 16 ref. OWRR-B-023-ORE (3), 14-31-0001-3324.

Descriptors: *Decisionmaking, Planning, Social aspects, *Oregon, *Alternative planning.

Identifiers: *Willamette Valley (Ore), *Differential reproduction, *Housing development.

Differential reproduction, the mechanism by which natural selection operates, is a criterion against which development decisions can be evaluated. The specific decision for which the criterion is used is in determining the relationship between alternatives open to the developers and the mechanisms of social control available to regulate a housing development along the Willamette River, Oregon. Accepting a global perspective, based on the systems modeling of Forrester, leads to the conclusion that for this housing development and other developments like it, alternatives should be managed to promote rehabilitation and reuse of land and resources, and mechanisms of social control should be established to limit continued resource exploitation. A global perspective, however, is unlikely in development decisions which are made to benefit specific groups of people until the global impacts of their actions can be shown to affect them. W74-01056

PROJECT PLANNING,

Bureau of Reclamation, Denver, Colo. Div. of Project Investigations.

For primary bibliographic entry see Field 08A.

W74-01059

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

MARKET PROBLEMS IN THE DISTRIBUTION OF EMISSION RIGHTS,

Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.

For primary bibliographic entry see Field 05G.

W74-00674

SEWER SYSTEM COST ESTIMATION MODEL

Voorhees (Alan M.) and Associates, Inc., McLean, Va.

For primary bibliographic entry see Field 05D.

W74-00745

SYSTEMATIC ERRORS IN COST ESTIMATES FOR PUBLIC INVESTMENT PROJECTS,

North Carolina Univ., Chapel Hill.

M. M. Hufschmidt, and J. Gerin.

In: The Analysis of Public Output, National Bureau of Economic Research, New York. 1970. J. Margolis, editor, p 268-315, 6 fig, 9 tab.

Descriptors: *Tennessee Valley Authority, *Estimated Costs, *Construction costs, Administration, Coordination, Projects.

Identifiers: *Cost overrun, Water-resource construction agencies, Errors, *Public investment projects.

The extent, nature and causes of error in estimating costs of public investment are discussed. Anal-

ysis is based on cost experience of the 3 largest U.S. water-resource construction agencies: the Army Corps of Engineers, Bureau of Reclamation and TVA—from 1933 to the early 1960's. With no adjustments for construction price levels, TVA cost overrun for dams and reservoirs is 22% of original estimated cost; Corps overrun is 124% for projects built or building prior to 1950, 36% for those completed between 1951 and 1964; while Reclamation overrun is 177% for projects built or building prior to 1955, 72% for all those built or building in 1960. Frequency of cost overruns were: TVA dams and reservoirs, 45%; Corps projects complete 1951-1964, 72%; all Reclamation projects built or building prior to 1955, 85%, for projects built in 1960, 75%. With adjustments for construction price levels, overrun tendencies are less. The first are price increases or authorized project extensions of changed local needs. Underlying factors may be further grouped in two classes: (1) those related to the project and the timing of survey and construction, and (2) those related to the administrative and institutional framework. Tentative conclusions are: that organizational and administrative context is the important variable; that agencies have achieved considerable improvement since the 1950's so that current performance shows no significant bias toward cost underestimation; and that recent agency experience reveals persistence of a sizable variance of error in spite of improvements. Implications for policy and administration are presented. (Edwards-North Carolina) W74-00751

THE ECONOMICS OF THE CATTLE FEEDING INDUSTRY IN ARIZONA,

Arizona Univ., Tucson. Dept. of Agricultural Economics.

E. L. Menzie, W. J. Hanekamp, and G. W. Phillips. Arizona Agricultural Experiment Station Tucson, Technical Bulletin 207. Oct. 1973. 82 p, 36 fig, 57 tab, 35 ref.

Descriptors: *Feed lots, *Farm wastes, *Cattle, *Zoning, *Cost analysis, Marketing, *Arizona, Legal aspects, Water pollution sources, Environmental effects, Economics.

Major objectives were to determine changes in the growth and structure of the cattle feeding industry, costs of operation, costs of custom feeding, production problems affecting the competitive nature of the industry, and to analyze the nature of growth and development in beef markets. Data are based on 1972 information, and projections have been made to 1982. Considerable attention is paid to the Arizona feed situation, supply of feeder cattle for Arizona, controls affecting livestock feeding; sources, methods, and costs of finance for feedlots and feeding, marketing of fat cattle and beef, and an assessment of Arizona's competitive position in beef production and marketing, along with the role of changing technology in the industry. The section on controls includes a review of health and sanitation problems of Arizona feedlots, the control of feed supplements, and environmental issues. A particular case involving a suit brought by a land developer against a cattle feeding operation with a non-conforming prior usage right is described; the developer was required to pay for costs involved in the relocation of the feedlot. Consideration of the effect of feedlot wastes on water quality has given rise to a number of research investigations relating to recycling, conversion to other products, confinement feeding, etc., all of which should be accelerated because of the rising demand for beef at the same time that feedlot controls are creating limitations on this type of beef production. (Paylore-Arizona) W74-00758

BANKS STUDY BASIN CLEANUP.

For primary bibliographic entry see Field 05D. W74-00772

WATER RESOURCES PLANNING—Field 06

Water Law and Institutions—Group 6E

WATER SUPPLY AND WASTE DISPOSAL POLICY REVIEW.
Indian Nations Council of Governments, Tulsa, Okla.
For primary bibliographic entry see Field 05D.
W74-00809

NONLINEAR EFFLUENT CHARGES,
California Univ., Riverside.
For primary bibliographic entry see Field 05G.
W74-00886

6D. Water Demand

THE USE OF GROUNDWATER IN MINNESOTA,
Minnesota Dept. of Natural Resources, St. Paul.
Div. of Waters, Soils and Minerals.
For primary bibliographic entry see Field 04B.
W74-00568

A REPORT OF PROGRESS AND CONCLUSIONS, (WASHINGTON, D.C. METROPOLITAN AREA WATER RESOURCES).
Washington Area Interstate Water Resources Program, D.C.

Available from NTIS, Springfield, Va., 22151 as PB-214 959 Price \$3.00 printed copy; \$1.45 microfiche. January 1973. 35 p, 7 fig, 1 tab.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *District of Columbia, Water demand, Water supply, Projections, Water quality, Hydrologic data, Reviews, Evaluation, Water treatment, Potomac River, Tributaries, Estuaries, Water utilization, Human population.
Identifiers: *Washington, D.C. metropolitan area.

In recent years the Washington metropolitan area has experienced an explosive growth in population. Construction of housing, highways and shopping centers has resulted in widespread erosion and increased volumes of stormwater from ever-expanding roof and paved areas. Also, this growth has been accompanied by increasing demands for normal services such as water supply and wastewater treatment. Yet, no provision has been made for adequate water supply, and wastewater treatment facilities, badly in need of expanding and upgrading, continue to pour pollutants into streams which are already degraded below applicable stream standards. The Governors of the States of Maryland and Virginia and the Commissioner of the District of Columbia recognized the critical need for concerted action on a regional basis. By joint resolution they formed a policy committee and a task force of representatives of the three jurisdictions and the Metropolitan Washington Council of Governments to develop an action program which would provide solutions to the water resources problems of the area. Since August 16, 1972, the task force has performed an intensive review of previous investigations, prepared a detailed analysis of future needs and existing facilities, and consulted with as many of the officials of local jurisdictions and citizen groups as time would permit. A summary of the analysis of needs vs facilities is included.
(Woodard-USGS)
W74-00583

EL PASO'S WATER RESOURCES,
El Paso Water Utilities, Tex.
J. T. Hickerson.
Presented at: Planning Seminar 'El Paso's Challenge: Reality or Myth,' February 8, 1966, El Paso, Texas. 18 p, 7 fig.

Descriptors: *Water supply, *Water sources, *Water requirements, *Projections, *Water reuse, *Texas, Planning, Groundwater, Water rights, Desalination, Water users, Water rates.
Identifiers: *El Paso (Tex), Rio Grande River.

For the El Paso region indicate that per capita use of water by 2020 will be 250 gallons per day and that the population will be about 900,000. Total accumulated water requirements to 2020 are projected and additional sources of water to meet this demand are discussed. Present water supply sources are the Rio Grande River and local groundwater. River flows are quite variable and groundwater is used largely for peak demand, especially in the summer. Possible additional sources of water include the importation of water from other areas, the desalination local brackish water (possibly from the Lower Valley Area), the blending of brackish water with good quality water (already being done in some cities), and the reclamation of wastewater. Two other possibilities are the expanded use of the present river and groundwater resources; the former would require new legal arrangements while the latter would involve increased mining of the groundwater, i.e. withdrawing it faster than it is being replenished naturally. (Elfers-North Carolina)
W74-00740

FINDINGS OF THE NATIONAL WATER COMMISSION,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06A.
W74-00812

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX B, THE LAND-RESOURCES AND USE, VOLUME II.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00889

WATER AND SEWER SERVICE NEEDS OF LOW AND MODERATE INCOME HOUSEHOLDS IN METROPOLITAN WASHINGTON.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W74-01034

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART I NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.

N. M. Jackson, Jr.
North Carolina Office of Water and Air Resources, Raleigh. July, 1972. 277 p, 4 fig, 63 maps, 45 tab, 5 ref.

Descriptors: *Water supply, *Water sources, *Water quality, Water storage, Water pumping, Planning, Chemical analysis, *North Carolina.
Identifiers: *Piedmont (NC), Public Water Supply Systems.

An inventory is presented of the public water supply systems in 18 counties in the northern Piedmont of the state of North Carolina. This area includes several major urban areas such as Greensboro, Winston-Salem, High Point, Raleigh, and Durham. Data presented are useful to planners and water managers interested in water availability, water resources development, and water quality. A county-by-county inventory (including maps) are presented. Information is provided on the population served, source of water, estimated allowable draft, industrial water use, raw and finished water storage, raw and finished water pumping capacity, future plans for expansion, chemical analyses of the raw and finished water, and an appraisal of the water supply source. Various categories of data presented and of the inventory procedures are explained. (Elfers-North Carolina)
W74-01040

SEWERAGE MASTER PLAN, EUGENE-SPRINGFIELD URBANIZING AREA.
Edmundson, Kochendoerfer, and Kennedy, Portland, Ore.; and Daniel, Mann, Johnson, and Mendenhall, Portland, Ore.
For primary bibliographic entry see Field 05D.
W74-01042

AREAWIDE WATER AND WASTE WATER PLANNING STUDY FOR THE ST. CHARLES MESA, RYE-COLORADO CITY, AND BEULAH SECTORS OF PUEBLO COUNTY.
Sellards and Grigg, Inc., Lakewood, Colo.
For primary bibliographic entry see Field 05D.
W74-01047

6E. Water Law and Institutions

TRENDS IN ENVIRONMENTAL LAW RELATED TO WATER RESOURCES PLANNING,
Auburn Univ., Ala. Center for Urban and Regional Planning.

D. D. Bracken.

Available from the National Technical Information Service as PB-224 824, \$4.25 in paper copy, \$1.45 in microfiche. Alabama Water Resources Research Institute, University Bulletin 16, 1973. 119 p, 4 append. OWRR X-132 (9074).

Descriptors: *Planning, Legal aspects, *Water rights, *Decision making, Standards, *Water law, State governments.

Identifiers: *Environmental law trends, Environmental standards.

Basic legal questions are gaining increasing attention in environmental actions in courts. The directions courts will take can have substantial impact on governmental decision-making bodies responsible for water resources planning. This study identified and discussed patterns and potential trends in four major areas of environmental law with twenty-one legal experts. Areas of consensus on developing patterns of significance for agency planning are reported. Broadened standing to sue requirements in state and federal courts suggest that agencies should not rely on lack of standing of individuals or groups to keep an environmentally significant decision from being litigated. Increased legislative and judicial protection of citizen rights to participate in agency decision-making and to force compliance with regulatory standards will also have an impact on agency decision-making procedures. Results in two remaining areas, expansion of Constitutional rights to include a right to a healthy environment and new interpretations of present common law doctrines and/or promulgation of new doctrines including public trust, were not as indicative of consensus on trends or their potential impact on agency activities. Evolution in legal doctrine is difficult to ascertain. But, given the import of trends in environmental law on decisions resulting in allocation of scarce national resources and this study's demonstration of the feasibility of identifying areas of consensus among legal experts, the development of indices of legal patterns as an input for agency decision-making models should be further investigated.
W74-00552

SUBURBAN AMERICA: POPULATION DYNAMICS AS RELATED TO WATER RESOURCES PLANNING,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W74-00553

QUALITY MANAGEMENT FOR WISCONSIN: A REPORT ON PRESERVING AND IMPROVING THE QUALITY OF THE AIR, LAND AND WATER RESOURCES.
For primary bibliographic entry see Field 05G.

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W74-00715

BODEGA: A CASE HISTORY OF INTENSE CONTROVERSY,
For primary bibliographic entry see Field 06G.
W74-00738

REGIONAL WATER SUPPLY/SEWAGE DISPOSAL PLAN AND SHORT-RANGE PROGRAM, 1973-1978.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 05D.
W74-00733

SAMPLING AND ANALYSIS OF CHEMICAL POLLUTANTS IN RIVER WATER,
Lee Conservancy Catchment Board (England).
For primary bibliographic entry see Field 05A.
W74-00773

CHEMICAL ANALYSIS OF WATER EF-FLUENTS — LESSONS FROM THE U.S. (ARMY CORPS OF ENGINEERS) PERMIT PROGRAM,
Institute of Paper Chemistry, Appleton, Wis. Div. of Natural Materials and Systems.
For primary bibliographic entry see Field 05A.
W74-00791

WATER REUSE IN INDUSTRY, PART 5 -- THE WATER POLLUTION CONTROL ACT: REACHING TOWARD ZERO DISCHARGE,
Polytechnic Inst. of Brooklyn, N.Y.
For primary bibliographic entry see Field 05D.
W74-00798

A BILL TO BE KNOWN AS THE 'SAFE DRINKING WATER ACT OF 1973'.
For primary bibliographic entry see Field 05F.
W74-00856

WALSH V. SPADACCIA (PROCEEDING TO SET ASIDE DETERMINATION OF TOWN BOARD APPROVING CONSTRUCTION PLANS WHICH DID NOT CONSIDER POLLUTION OF LAKE).

343 N.Y.S.2d 45-55 (Sup Ct, Westchester County 1973). 11 p.

Descriptors: *Zoning, *Septic tanks, *New York, *Sewage effluents, Project planning, City planning, Judicial decisions, Land use, Land development, Water pollution sources, Legal review, Administrative decisions, Legislation, Local governments.
Identifiers: Administrative regulations.

Plaintiffs, two unincorporated associations of homeowners and four individual homeowners, brought suit to vacate the approval by the town board of the site plan for a large apartment complex. Plaintiffs alleged that the board had acted arbitrarily and capriciously in rendering its approval in that it had not given consideration to the effect of the apartments on the pollution of an adjacent lake resulting from septic tanks. The plans submitted to the board did not meet local standards in many respects, particularly in regard to the sewer system. This was because, in making its decision, the board had relied on the County Health Department as far as sewage requirements were concerned, and the Health Department was unaware of the stringent requirements of this particular township. The court found that the town board had acted arbitrarily and capriciously in disregarding the township requirements relevant to septic systems and therefore annulled the approval of the site plan. (McKnight-Florida)
W74-00857

INCREASING PROTECTION FOR OUR WATERS, WETLANDS, AND SHORELINES: THE CORPS OF ENGINEERS.

Seventeenth Report—Comm. on Government Operations, 92d Cong, 2d Sess, August 10, 1972. 49 p, 1 append.

Descriptors: *Wetlands, *Shores, *Navigable waters, *Water resources development, Legal aspects, Jurisdiction, Rivers and Harbors Act, Water quality standards, Exploitation, Jurisdiction, Water pollution sources, Landfills, Dredging, Permits, Administrative agencies.
Identifiers: *Corps of Engineers, Coastal waters, Coastal zone management, Fill permits.

The report is based on several hearings and ongoing studies conducted by the Subcommittee concerning the role of the Corps of Engineers in Administering and protecting the Nation's wetlands and waterways. The hearings and studies revealed that the Corps in the past has exercised its responsibilities over navigable waters with a more restrictive view of its responsibilities than is required by law; and that this self-imposed limitation has resulted in less effective protection for many waters, wetlands, and shorelines. Recent developments in the Corps' efforts to broaden its protection of waters and wetlands are reviewed, and additional steps which should be taken to accomplish that objective are discussed. The Corps of Engineers has major statutory responsibilities affecting these waterways, shorelines, and wetlands. The Corps approves annually thousands of applications for permits and letters of permission under the Rivers and Harbors Act of 1899 to dredge, fill, construct structures in or discharge refuse into navigable waters. A list of conclusions and principal recommendations is included. (Mockler-Florida)
W74-00858

THE DRAFT UNITED NATIONS CONVENTION ON THE INTERNATIONAL SEABED AREA—AMERICAN PETROLEUM INSTITUTE POSITION,

American Petroleum Inst., New York.
For primary bibliographic entry see Field 05G.
W74-00859

A BILL TO AUTHORIZE CONSTRUCTION OF THE LITTLE CYPRESS LAKE AND RESERVOIR, TEXAS.

House Bill 5297, 93rd Cong, 1st Sess (1973), 2 p.

Descriptors: *Legislation, *Texas, *Reservoirs, *Reservoir construction, Lakes, Reservoir sites, Legal aspects, Planning, Water resources development, Federal budget.

The bill authorizes the construction of the Little Cypress Lake and Reservoir, Texas, by the Secretary of the Army, acting through the Chief of Engineers, in accordance with existing, specified plans. Construction is not to be initiated until it has been approved by the Secretary of the Army and the President. (Reed-Florida)
W74-00861

A BILL TO PROVIDE FOR THE ESTABLISHMENT OF THE LOWELL HISTORIC CANAL DISTRICT NATIONAL CULTURAL PARK.

House Bill 4514, 93rd Cong, 1st Sess (1973). 5 p.

Descriptors: *Massachusetts, *Legislation, *National Historic Parks, *Recreation, *United States, Education, Legal aspects, Planning, Administration, Contracts, Governmental interrelations, Local governments, Recreation facilities.
Identifiers: *National Cultural Parks, *Tort liability, *Indemnification.

The proposed bill authorizes the Secretary of the Interior to establish the Lowell Historic Canal District National Cultural Park in Lowell, Massachusetts. The Secretary is authorized, with the concurrence of the Lowell Historic Canal District Commission established under this proposed act, to designate certain properties in the city of Lowell for establishment as the park. The means by which the Secretary may acquire the necessary lands and personal property are specified. The bill authorizes the Secretary to cooperate and enter into agreements with the Commission, State and local public bodies, and private interests relating to the acquisition, planning, development or use of real and personal property for educational, cultural, historic or recreational purposes. The Secretary may agree to indemnify any private individual partnership or corporation, which entered into an agreement with the Secretary to construct, maintain and operate a public facility in accordance with plans and standards established by the Commission. (Reed-Florida)
W74-00862

A BILL TO AMEND THE RIVER AND HARBOR ACT OF 1973 RELATING TO THE CHICAGO RIVER, ILLINOIS.

House Bill 271, 93rd Cong, 1st Sess (1970). 2 p.

Descriptors: *Legislation, *Channel improvement, *Rivers and Harbors Act, *Illinois, Rivers, Navigation, Flood control, Water pollution control, Water pollution, Legal aspects, Water resources development, Flood protection.
Identifiers: *Unsightliness.

The proposed bill provides for the amendment of the Rivers and Harbors Act so as to authorize the Secretary of the Army to undertake measures to clear the channel of the North Branch of the Chicago River, Illinois, of objects which contributes to flooding, unsightliness and pollution of the river and to maintain the channel free of such objects. The proposed amendment also specifies appropriation limitation for the project. (Reed-Florida)
W74-00863

A BILL TO PROVIDE FOR THE ESTABLISHMENT OF THE POTOMAC BASIN NATIONAL RIVERWAYS.

House Bill 1884, 93rd Cong, 1st Sess (1973). 11 p.

Descriptors: *Legislation, *River basin development, *Recreation, Comprehensive planning, Land use, Aesthetics, Legal aspects, Water quality standards, Water pollution control, Aquatic habitat, Wildlife conservation, Federal government, Governmental interrelations.

This bill seeks to preserve and develop for the enjoyment of all the waters of the Potomac River Basin and adjacent land areas. The legislation further provides that the Secretary of the Interior (Secretary) shall encourage state, regional, country, and municipal bodies to adopt and enforce adequate master plans and zoning ordinances which will promote the use and development of private property within and adjacent to the national riverways in a manner consistent with the Act. He is authorized to provide technical assistance to such bodies in the development and adoption of such plans. Moreover, the Secretary shall permit hunting and fishing on lands and waters under his jurisdiction within the boundaries of the Potomac Basin National Riverways in accordance with the appropriate federal and state laws, except that he may designate zones where, and establish periods when, no hunting or fishing shall be permitted for reasons of public safety, administration, fish or wildlife management, or public use and enjoyment. (Mockler-Florida)
W74-00864

WATER RESOURCES PLANNING—Field 06

Water Law and Institutions—Group 6E

A BILL TO AUTHORIZE THE ACQUISITION OF THE BIG CYPRESS NATIONAL FRESH WATER RESERVE.

House Bill No 46, 93rd Cong, 1st Sess (January 3, 1973). 6 p.

Descriptors: *Legislation, *Florida, *Swamps, Environmental effects, Recreation, Wildlife habitat, Aquatic environment, Wetlands, Marshes, Aquatic habitats, Mangrove swamps, Standing waters, Freshwater fish, Wildlife, Small game.

This bill would authorize the acquisition of the Big Cypress National Fresh Water Reserve in the State of Florida because the unique natural environment of this area should be protected from further development which would significantly and adversely effect its ecology. The proposed bill would authorize the Secretary of the Interior to: acquire by donation, purchase with donated or appropriated funds, transfer from any other federal agency, or exchange land and interests within the area in question. The proposed boundaries of the area may not encompass more than five hundred and forty-seven thousand acres of privately owned land. Property owned by the State of Florida or any political subdivision thereof may be acquired only by donation. The Secretary shall permit hunting, fishing, and trapping on lands and waters under his jurisdiction within the reserve in accordance with the applicable laws of the U.S. and the State of Florida except that he may designate areas and times in which no hunting, fishing, or trapping will be permitted for reasons of public safety or public use and enjoyment. (Mockler-Florida)

W74-00865

COMMONWEALTH V. BARNES AND TUCKER COMPANY (SUIT FOR MANDATORY INJUNCTION REQUIRING DEFENDANT TO TREAT ACID MINE DRAINAGE FROM MINE).

303 A.2d 544-575 (Pa. Cmwlth. 1973).

Descriptors: *Judicial decisions, *Mining, *Drainage, *Legal aspects, *Pennsylvania, Nuisance, Acid mine water, Mine drainage, Mine wastes, Mine water, Waste dumps, Public health, Water quality standards, Water law.

Identifiers: Nuisance (Legal aspects).

This case involved a complaint in equity for a mandatory injunction brought by the complainant-state against the defendant mine owner requiring the defendant to treat acid mine drainage discharging from the company's mine, as the discharge did not meet the minimum water quality standards. The court held for the defendant who held a time-extended mine drainage permit under the 1965 amendment to the Clean Streams Law. The court held the defendant did not assume the responsibility, by reason of the provisions of the Clean Streams Law or regulations promulgated thereunder then in effect, for any mine drainage discharge after the cessation of mining and that it was not the responsibility of the defendant to abate the water's polluting qualities. Moreover, the court indicated that the mine water discharge constituted neither a public nuisance under the Clean Streams Law nor a common-law nuisance for which the defendant would be responsible. (Mockler-Florida)

W74-00866

ARE OCEAN POLLUTERS SUBJECT TO UNIVERSAL JURISDICTION--CANADA BREAKS THE ICE,

For primary bibliographic entry see Field 05G.

W74-00867

NATIONAL RESOURCES DEFENSE COUNCIL INC. V. GRANT (ACTION TO PERMANENTLY ENJOIN CONSTRUCTION OF WATERSHED

PROJECT).

355 F. Supp 280-290 (E.D.N.C. 1973).

Descriptors: *North Carolina, *Environmental control, *Environmental effects, *Judicial decisions, *Federal jurisdiction, Sediment control, Sediment discharge, Watershed management, Regulation, Administrative agencies, River and Harbors Act, Eutrophication, Legal aspects, Ecology, Aquatic habitats, Judicial review.

Identifiers: *National Environmental Policy Act, *Injunctive relief, *Environmental impact statement.

Plaintiffs, private environmental groups, sought injunctive relief claiming that defendants, government officials, failed to satisfy the requirements of the National Environmental Policy Act of 1969 (NEPA) and that implementation of the project would violate section 13 of the Rivers and Harbors Act of 1899. The preliminary injunction was granted until an environmental impact statement was filed according to NEPA. After filing of the final impact statement the injunction was dissolved. Plaintiff moved for new injunction pending appeal. The Court of Appeals remanded for a preliminary hearing on the adequacy of the final statement. The court on remand found: (1) the statement misrepresented the adverse environmental effects of the project upon fish habitat, (2) misrepresented effect upon fish resources, (3) ignored effect on potential eutrophication problems in Tar Pamlico estuary, (4) failed to disclose maintenance history of PL 566 Projects, (5) ignored serious environmental consequences of proposed use of Kudzu, (6) did not disclose or discuss cumulative effects, (7) failed to fully disclose or adequately discuss alternatives. The court therefore found the final statement was not a 'full disclosure' as required by NEPA and granted the new preliminary injunction. (Napolitano-Florida)

W74-00868

EFFLUENT NEIGHBORS: THE MEXICO-UNITED STATES WATER QUALITY DILEMMA,

For primary bibliographic entry see Field 05G.
W74-00869

WATER POLLUTION-USER OF CITY SEWER SYSTEM CREATES NUISANCE AGAINST LOWER RIPARIAN,

For primary bibliographic entry see Field 05G.
W74-00870

REPORT OF PROCEEDINGS AT PUBLIC HEARING RELATING TO AN APPLICATION FILED BY AROUSED RESIDENTS OF CROWDER'S CREEK INC. REQUESTING RECLASSIFICATION OF CROWDER'S CREEK, CATAWBA RIVER BASIN, CLEVELAND AND GASTON COUNTIES .

For primary bibliographic entry see Field 05G.

W74-00871

PROJECTS PROPOSED FOR INCLUSION IN OMNIBUS RIVER AND HARBOR AND FLOOD CONTROL LEGISLATION--1972.

Joint Hearings--Subcomm. on Rivers and Harbors and Subcomm. on Flood Control and Internal Development--Comm. on Public Works, U.S. House of Representatives, 92d Cong, 2d Sess, February and March 1972.

Descriptors: *Federal government, *Legislation, *Rivers and Harbors Act, *Flood control, Navigation, Erosion, Wildlife habitat, River basin development, Resources development, Environmental effects, Comprehensive planning, Water resources development.

Testimony was given in joint congressional hearings to consider projects proposed for inclusion in the Omnibus River and Harbor and Flood Control legislation of 1972. The committee heard testimony from representatives of the U.S. Corps of Engineers, members of Congress, and citizens concerning 26 new flood control and river and harbor projects costing over \$205 million. This number includes six projects dealing with navigation and beach erosion control, 18 on flood control and hurricane protection, and 2 for fish and wildlife projects. Specific projects considered included the Edwards Underground Reservoir in San Antonio, Texas, the Arkansas River Basin Project, the Pecos River project near Alpine, Texas, the North Shore project in Long Island, New York, and the Hooper Harbor Project in Alaska. Alternatives to the proposed projects as well as adverse environmental effects of the proposals are given, and charts, graphs, and other illustrations are included. (Mockler-Florida)

W74-00872

DESIGNATION OF WILDERNESS AREAS, PART II.

Hearings--Subcomm. on Public Lands--Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, 1972. 301 p.

Descriptors: *Legislation, *National forests, *Wildlife, *Wildlife conservation, *United States, Administration, Governments, Legal aspects, Planning, Regulation, Boundaries (Property), Constraints, Montana, Oregon, Colorado.

Identifiers: *Wilderness areas.

The purpose of the hearings was to consider several bills dealing with wilderness areas. The bills would authorize and direct the Secretary of Agriculture to classify as wilderness the national forest lands in certain parks of Montana; add and modify the boundaries of the Wallowa National Forest in Oregon; and authorize the Secretary to review as to its suitability for preservation as wilderness, the Indian Peaks area in Colorado. Reports from the Departments of Agriculture and Interior were made to the subcommittee as were statements from various interested private conservation and wildlife organizations. Statements were also given by a number of representatives from governmental agencies. (Reed-Florida)

W74-00873

LONE PEAK WILDERNESS AREA, UTAH, AND DESIGNATING A SEGMENT OF THE COLORADO RIVER IN UTAH AS PART OF THE WILD AND SCENIC RIVERS SYSTEM.

For primary bibliographic entry see Field 04C.

W74-00874

RESTORE RURAL WATER AND WASTE DISPOSAL GRANT PROGRAMS.

For primary bibliographic entry see Field 05G.
W74-00875

FIVE YEAR EXTENSION FOR RESEARCH AND DEVELOPMENT, PUBLIC LAW 92-60 (FINAL ENVIRONMENTAL STATEMENT).

Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.

W74-00876

ARKANSAS SOIL AND WATER CONSERVATION COMMISSION.

Arkansas Stat. Ann. secs 9-101 thru 9-128 (Supp. 1971).

Descriptors: *Legislation, *Water resources development, *Conservation, *Arkansas, Administration, Interstate waters, Watershed management, Flood control, Soils, Navigation,

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Water quality management, Governmental inter-relations.

This act creates the Arkansas Soil and Water Conservation Commission. The Commission shall consist of seven members to be appointed by the Governor and approved by the Senate. Each congressional district shall be represented by membership on the Commission. The Act provides that the Commission shall have the authority to enter into negotiations with the duly authorized representatives of adjoining states as to the protection and use of interstate waters in streams, lakes, reservoirs, or natural or artificial channels of impoundments. The Commission is empowered to employ a water resources engineer. In addition, the Commission shall cooperate with federal agencies in the development of their plans for federal public works under the Public Works Acceleration Act, or other federal law of similar import, in such projects as small watersheds, river and harbor, flood control, soil conservation, river navigation, and hydroelectric power. Moreover, the Commission may take such other action as it shall deem necessary or desirable to carry out the purposes and intent of the Act. (Mockler-Florida)
W74-00878

LOUISIANA GOVERNMENT AND THE COASTAL ZONE-1972.

March, 1972. 45 p, 4 fig.

Descriptors: *Planning, *Coastal marshes, *Environmental effects, *Ecosystems, Wetlands, Urbanization, Land use, Administration, Coordination, Institutions, *Louisiana.
Identifiers: *Coastal zone management, State agencies.

Louisiana Act 35 of 1971 charged the Louisiana Advisory Commission on Coastal and Marine Resources to prepare a Coastal Zone Management Plan by September 15, 1973. This is the first progress report on the planning efforts. Emphasis is on describing the nature of Louisiana's coastal zone including the problems related to the strong pressures for industrial development and analyzing the state institutional structure for management of the coastal zone. The coastal zone is a delicately balanced and highly vulnerable ecosystem. Thus, uncoordinated activities including urban and industrial development and flood control projects have changed natural processes and adversely affected fish and wildlife. The Coastal Zone Management Plan would promote orderly development, protect environmental resources and processes, and coordinate state and private agencies and groups. A key problem in the past has been a lack of state policy on coastal zone management and the lack of coordination among state agencies with regard to activities related to ecological processes, for example, water quality management. Thus, 23 state agencies whose activities have a significant effect on coastal and marine resources are analyzed. (Elfers-North Carolina)
W74-01028

NORTH CAROLINA WATER PLAN-PROGRESS REPORT, CHAPTER 35-NEW RIVER BASIN.

For primary bibliographic entry see Field 06B.

W74-01033

WETLANDS '73: TOWARD COASTAL ZONE MANAGEMENT IN LOUISIANA.

Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 02L.
W74-01043

6F. Nonstructural Alternatives

FLOOD MANAGEMENT PLAN--WARNING, DAMAGE, COORDINATION.

Denver Regional Council of Governments, Colo.

Available from NTIS, Springfield, Va. 22151 as PB-218 963 Price \$3.00 printed copy; \$1.45 microfiche. Project REUSE Report DRCOG-72-009, June 1972. 46 p, 2 fig, 1 tab, append. HUD Contract 1392.

Descriptors: *Flood control, *Flood forecasting, *Flood data, *Hydrologic data, *Colorado, Flood damage, Flood plain zoning, Flood routing, Erosion control, Sediment control, Streamflow, Rainfall-runoff relationships, Flow characteristics, Flow augmentation, Flood profiles, Flood protection.

Identifiers: *Flood management plan (Colo), *Denver region (Colo).

A review of the status of existing mechanisms for flood warning and prediction within the Denver region was undertaken to define the degree of responsibility of various federal, state and local agencies for flood warning and protection. Current efforts of the Colorado Department of Natural Resources, through the State Engineer's Office, to automate the collection and recording of information on streamflows and water right diversions, were reviewed to provide compatibility between the flood warning system and the State Engineer's administrative data collection procedures. The responsibility and current capability of the National Weather Service (Weather Bureau) have also been investigated, to provide for their continued inclusion in, and coordination with, the program. In support of a broad flood management program, encompassing prevention of future losses as well as warning of impending danger, a method of monitoring, recording, and analyzing actual damage is described. (Woodard-USGS)
W74-00817

A PROGRAM FOR STORM DRAINAGE AND FLOOD CONTROL-1971-1990: DAMAGE PREVENTION, MAJOR DRAINAGEWAYS, MASTER PLANNING, REGIONAL MANAGEMENT.

Denver Regional Council of Governments, Colo.

Available from the National Technical Information Service as PB-218 961, \$3.25 in paper copy, \$1.45 in microfiche. Project REUSE Final Report (Supplement). August, 1972. 94 p, 14 fig, 10 tab. COLO-USE-1. DHUD-H-1392.

Descriptors: *River basin development, *Regional analysis, *Flood plain zoning, *Storm runoff, Criteria, Standards, Forecasting, Flood control, Runoff, Coordination, *Colorado, Urban runoff, Urban drainage.

Identifiers: Preventive master planning, Detention ponding, *Denver SMSA (Colo), Design master planning.

The Denver Standard Metropolitan Statistical Area, Adams, Arapahoe, Boulder, Denver and Jefferson Counties, is drained by the South Platte river and its tributaries. Urbanization, heavy runoff from snowmelt, and high intensity localized storms combine to create severe flooding. This proposed major drainage program to provide up to 100 year frequency and flood runoff protection is divided into a short-range program (through 1975) with emphasis on preventive multi-jurisdictional master planning and design master planning, and the long-range program (1976-1990), where emphasis will shift to construction. Short range objectives are: completion of 320 channel miles of preventive master planning and 97 miles of design master planning concentrated on high and moderate potential flood damage areas; (2) reduction of backlog of major drainage needs; (3) pro-

tection from a 100 year frequency storm for 42% of the area by preventive measures, facilities, and/or flood insurance; and (4) development and enforcement of a runoff control ordinance. During the construction period emphasis will shift to attainment of 100 year protection for all areas except in areas where costs are prohibitive. Here flood insurance coverage can be provided. Programs for each period are detailed including project scheduling and timing. Implementation strategy and recommendations are based on criteria developed under Project REUSE (Reviewing the Environment through Urban Systems Engineering). Financing, organization, flood plain zoning and insurance, and detention ponding are discussed. (Hoffman-North Carolina)
W74-01038

6G. Ecologic Impact of Water Development

TRENDS IN ENVIRONMENTAL LAW RELATED TO WATER RESOURCES PLANNING,

Auburn Univ., Ala. Center for Urban and Regional Planning.

For primary bibliographic entry see Field 06E.

W74-00552

LEAST-COST ALLOCATION AND VALUATION MODEL FOR WATER RESOURCES,

city Univ. of New York. Dept. of Mathematics.

For primary bibliographic entry see Field 05D.

W74-00670

BODEGA: A CASE HISTORY OF INTENSE CONTROVERSY,

J. W. Hedgpeth.

In: Environmental Quality and Water Development, W. H. Freeman, and Co. San Francisco, 1973. C. R. Goldman editor, p 438-454, 3 fig, 7 ref.

Descriptors: *Recreation, *Shores, *Powerplants, *Thermal pollution, *Nuclear powerplants, Earthquakes, Political aspects, *California, Radioactivity, Safety.

Identifiers: Sonoma County (Calif), San Andreas Fault, *Bodega Head (Calif).

Bodega Head, a small peninsula north of San Francisco Bay adjacent to the San Andreas fault, was announced in the late 1950s as the proposed site for an atomic power plant by Pacific Gas and Electric Company (PG and E). At the same time the University of California expressed an interest in the site for a marine science laboratory. The controversy generated by these announcements and court actions which followed as PG and E exercised its right to eminent domain is described from the vantage point of personal participation. Sonoma County Harbor Commission and Sonoma County Commissioners remained relatively neutral. The conflict was characterized by a lack of information about geological conditions, offshore currents, and mixing patterns as they related to power plant thermal pollution. The marine science laboratory was built while the controversy over the power plant continued. By 1962 the Sierra Club and other conservationists were engaged in the battle against PG and E. Revelations of old rock fractures on the site and discovery of a complex faulting structure offshore together with awareness of earthquake danger and radiation leakage apparently played a part in the decision-making process. In 1964 AEC refused to grant a license to PG and E based on safety requirements. The site was later acquired as part of the state park system. The significance of the controversy in terms of citizen participation and the problems involved in dealing with conservation and preservation issues are discussed. (Edwards-North Carolina)
W74-00738

RESOURCES DATA—Field 07
Data Acquisition—Group 7B

POLICY PLAN FOR DEVELOPMENT OF LANSING'S WATERFRONT.
Waterfront Development Board, Lansing, Mich.
For primary bibliographic entry see Field 03D.
W74-00742

PROTECTING OUR WATER ENVIRONMENT.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 05G.
W74-00743

PRICKETT CREEK WATERSHED, WEST VIRGINIA (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04A.
W74-00860

A BILL TO AUTHORIZE THE ACQUISITION OF THE BIG CYPRESS NATIONAL FRESH WATER RESERVE.
For primary bibliographic entry see Field 06E.
W74-00865

FIVE YEAR EXTENSION FOR RESEARCH AND DEVELOPMENT, PUBLIC LAW 92-60 (FINAL ENVIRONMENTAL STATEMENT).
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W74-00876

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W74-00879

LOST CREEK WATERSHED, NEWTON COUNTY, MISSOURI (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W74-00880

GILLHAM LAKE, COSSATOT RIVER ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00881

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX II (PHOTOGRAPHS), APPENDIX III (ENVIRONMENTAL ELEMENTS), (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00882

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX C, THE BAY-PROCESSES AND RESOURCES, VOLUME II.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00891

ECOLOGICAL AND ENVIRONMENTAL CONSIDERATIONS.
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08A.
W74-01060

07. RESOURCES DATA

7A. Network Design

NEEDS AND USES FOR A GROUND WATER QUALITY DATA SYSTEM,
Minnesota Univ., St. Paul. Agricultural Extension Service.
L. Hanson.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeographed Report, p 102-105, February 1973. 5 ref. 14-31-0001-3823.

Descriptors: *Data collections, *Hydrologic data, *Minnesota, Network design, Planning, Water management (Applied), Water quality, Water pollution, Monitoring, Warning systems.

The major objective of Minnesota's proposed groundwater quality information system is to provide an early warning system to alert State agencies with responsibility for management of this resource of future problems. This is extremely important because of the long-time frame involved in groundwater movement. Surface contamination may effectively destroy a water supply or make necessary expensive treatment processes for the affected communities. The investment of a modest amount of State resources to develop such a system would essentially be an inexpensive insurance policy designed to protect a State resource worth billions of dollars. Priority objectives for the information system are early warning of deterioration of groundwater quality for responsible governmental agencies; providing base line information on natural or present water quality; providing guide for land use planning and land use controls as related to groundwater quality; providing a basis for educational programs on groundwater resources; providing service to individuals, engineers, water well contractors and local government regarding best well locations and formations for water supply; and providing scientific and technical data for a variety of uses such as tracing of groundwater movement and prospecting for other economic resources. (See also W73-09113) (Knapp-USGS)
W74-00573

WATER WELL RECORDS AND INFORMATION SYSTEM NEEDS,
Minnesota Dept. of Health, Minneapolis. Div. of Environmental Health.
For primary bibliographic entry see Field 07C.
W74-00574

SAMPLING FOR WASTE WATER ANALYZERS. PART I: SYSTEMATIC APPROACH,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W74-00642

SAMPLING FOR WASTE WATER ANALYZERS. PART II: EFFECTIVE APPLICATIONS,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W74-00663

7B. Data Acquisition

DIFFERENTIAL COUNTING IN MIXED CULTURES WITH COULTER COUNTERS,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 05A.
W74-00614

MONITORING OF DUMPING BY MEANS OF SATELLITE REMOTE SENSING,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 05B.
W74-00635

REMOTE SENSING OF OIL SLICKS,
For primary bibliographic entry see Field 05A.
W74-00638

SAMPLING FOR WASTE WATER ANALYZERS. PART I: SYSTEMATIC APPROACH,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W74-00642

SAMPLING FOR WASTE WATER ANALYZERS. PART II: EFFECTIVE APPLICATIONS,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W74-00643

A CENTRIFUGAL TENSILE TESTER FOR SNOW,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W74-00682

THE ROCKY MOUNTAIN MILLIVOLT INTEGRATOR FOR USE WITH SOLAR RADIATION SENSORS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02D.
W74-00690

PHOTGRAMMETRIC DETERMINATIONS OF SNOW COVER EXTENT FROM UNCONTROLLED AERIAL PHOTOGRAPHS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W74-00697

COMPARISON OF FIELD METHODS FOR MEASURING STREAM DISCHARGE,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
For primary bibliographic entry see Field 02E.
W74-00735

PROPOSAL OF A SIMPLIFIED MANOMETRIC METHOD FOR MEASURING BIOCHEMICAL OXYGEN DEMAND — RESULTS AND PROBLEMS (VORSCHLAG EINER VEREINFACHTEN MANOMETRISCHEN METHODE ZUR MESSUNG DES BIOCHEMISCHEN SAUERSTOFFBEDARFS — ERGEBNISSE UND PROBLEME),
Institut fuer Zellstoff und Papier, Heidenau (East Germany).
For primary bibliographic entry see Field 05A.
W74-00782

Field 07—RESOURCES DATA

Group 7B—Data Acquisition

ADSORPTIVE EXTRACTION FOR ANALYSIS OF COPPER IN SEAWATER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W74-00827

POSSIBILITIES OF USING GEOPHYSICAL METHODS IN A STUDY OF FRESHWATER DISCHARGES IN LITTORAL ZONES OF SEAS (O VOZMOZHNOSTYAKH GEOFIZICHESKIH METODOV PRI IZUCHENII RAZGRUZOK PRESNYKH VOD V PРИБРЕЗНЬИХ ЗОНАХ MOREY),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02F.
W74-00847

A COMPILATION OF STUDIES FROM ATMOSPHERIC VARIABILITY EXPERIMENT (AVE),
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 02B.
W74-00851

SOME SIMPLE METHODS FOR LIMNOLOGICAL STUDY IN SHALLOW WATER,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
G. Marlier, G. Gallez, G. Hachez, and C. Wattiez.
Bull Inst R Sci Nat Belg Biol, Vol 48, No 5, p 1-11, 1972, Illus, English summary.
Identifiers: Dredges, Limnological studies, Methods, Nets, *Productivity (Plankton), *Plankton sampler, *Sampling (Shallow-water).

A simple plankton sampler is described which avoids the drawback of clogging of nets. It is used in shallow waters of ponds during studies on productivity. Another type of plankton sampler made of a narrow net is also depicted, the features of which are also intended to avoid clogging. It is used under the same conditions and gives comparable results to the first device. Then, 2 methods are proposed for splitting plankton samples not large enough for using the commercially available plankton-splitters. Lastly, a small quantitative dredge for benthic organisms to be used in shallow ponds or littoral waters, is described.—Copyright 1973, Biological Abstracts, Inc.
W74-00998

COMPARISON OF 2 METHODS OF TREATING WATER SAMPLES ('ACTUAL IN SITU' AND 'SIMULATED IN SITU') FOR STUDY OF PRIMARY PRODUCTION BY THE CARBON 14 TECHNIQUE (IN FRENCH),
M. Angot.
Cah O R S T O M (Off Rech Sci Tech Outre-Mer) Ser Oceanogr, Vol 10, No 1, p 71-73, 1972, English summary.

Identifiers: *Carbon-14 technique, *Madagascar (Nosy Be), *Primary production, Samples, Measurement.

Primary production measurements were carried out in Nosy Be (Madagascar) by the ^{14}C technique. Statistical tests show that the results obtained by 'in situ' and 'in situ simulated' are the same.—Copyright 1973, Biological Abstracts, Inc.
W74-01004

CONCERNING A NEW GRAPHIC METHOD FOR STUDY OF NATURAL WATERS (IN FRENCH),
Institut National des Sciences Appliquées, Toulouse (France).
For primary bibliographic entry see Field 02K.
W74-01008

TIME-TABLES AS A METHOD TO RECORD CHANGES IN PLANKTON COMPOSITION,
Research and Advisory Inst. for Field Crop and Grassland Husbandry, Wageningen (Netherlands).
B. J. Hoogers, and H. G. Van Der Weij.
Inst Biol Scheik Onderz Landbouwgewassen Wageningen Meded, 451, p 19-27, 1971.
Identifiers: Plankton data, Records, *Time tables, Methodology, *Phytoplankton, *Zooplankton.

In 1967 Hoogers introduced the use of time-tables to record the development throughout the year of ditch vegetations. A method is introduced to record in a similar way the composition of phytoplankton and zooplankton. Of the phytoplankton and zooplankton samples that are taken at regular intervals the numbers of specimens of individual species observed in 100 optical fields are expressed in scale values and introduced on a time scale. The method is demonstrated by means of data obtained in a fertilization experiment.—Copyright 1973, Biological Abstracts, Inc.
W74-01010

EVALUATION OF A REMOVAL METHOD FOR ESTIMATING THE NUMBERS OF ROCK POOL CORIXIDS (HEMIPTERA, CORIXIDAE),
Helsinki Univ. (Finland). Dept. of Zoology.
V. I. Pajunen.

Ann Zool Fenn. Vol 9, No 3, p 152-155. 1972.
Identifiers: Corixidae, *Corixids, Hemiptera, Heteroptera, Methodology, *Rock pools, *Nets.

The numbers of larval and adult corixids in small rock pools were estimated by a removal method. Standardized net sweeps were used as units of catch, each removing 8-20% of the numbers remaining; the total catch comprised 50-85% of the total numbers. Estimates based directly on daily catches varied greatly, but acceptable results were obtained by using parameters estimated from pooled data of 3 yr. Significant differences in catchability were found between earlier and later developmental stages. By pooling the information for different stages and for different rock pools, 95% confidence limits differing by 10-50% from point estimates of total numbers were obtained.—Copyright 1973, Biological Abstracts, Inc.
W74-01055

WATER QUALITY ASSESSMENT PRACTICE IN AUSTRALIA,
Melbourne Water Science Inst. (Australia).
For primary bibliographic entry see Field 02K.
W74-01089

7C. Evaluation, Processing and Publication

TRAVEL TIME OF GEORGIA STREAMS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 04A.
W74-00556

GROUND WATER, A RESOURCE TO BE PROTECTED,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 05B.
W74-00566

NEEDS AND USES FOR A GROUND WATER QUALITY DATA SYSTEM,
Minnesota Univ., St. Paul. Agricultural Extension Service.
For primary bibliographic entry see Field 07A.
W74-00573

WATER WELL RECORDS AND INFORMATION SYSTEM NEEDS,
Minnesota Dept. of Health, Minneapolis. Div. of Environmental Health.
E. H. Ross.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeographed Report, p 106-124, February 1973. 10 fig, 2 tab. 14-31-0001-3823.

Descriptors: *Water quality, *Groundwater, *Data collections, *Monitoring, *Minnesota, Sampling, Well data, Water wells, Planning.

In Minnesota, standards are established for the design, location, and construction of water wells within the State. The driller is required to submit well record information on each well drilled which includes data on geology, water quality and quantity, construction methods, and equipment. State Health Department laboratory staff performs chemical and biological analyses on water samples. The Department of Natural Resources uses the data for furthering their information on location and distribution of groundwater resources and their allocation. The Geological Survey uses the data for refinement of the geological mapping of the State. The Health Department uses the data to assist in evaluating the degree to which the water well contractors are complying with the provisions of the law for licensing and regulation and more specifically for compliance with the regulations on standards for well construction. (See also W73-09113) (Knapp-USGS)
W74-00574

SUBSURFACE GEOLOGIC INFORMATION SYSTEM IN MINNESOTA: A STATUS REPORT,
Geological Survey, Minneapolis, Minn.
G. B. Morey.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information Systems and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeographed Report, p 125-141, February 1973. 8 fig, 2 tab, 4 ref. 14-31-0001-3823.

Descriptors: *Data storage and retrieval, *Data collections, *Minnesota, *Hydrologic data, Geology, Hydrogeology, Data processing.

An efficient data storage and retrieval system was established in Minnesota for geologic information. The Minnesota Geological Survey maintains a central file for the State by storing it in a digital computer system capable of printing out data as required. The well log data includes name, age, depth to top, and thickness of each lithologic unit encountered; and a description of each unit, including bedding characteristics, color, grainsize, sorting and other characteristic textures, type and amount of cement, porosity, permeability, and mineral composition. The system is capable of retrieving data in several ways. A printout summarizes data from one drill hole, or a printout summarizing all available data is available. Specific data may be obtained for a specific area. The computer, interfaced with various automatic plotters, will provide data in an interpretable form, such as contour maps or graphs, directly to the user. (See also W73-09113) (Knapp-USGS)
W74-00575

GROUND WATER QUALITY INFORMATION SYSTEMS - EXPERIENCES IN OTHER STATES,
Minnesota Univ., Minneapolis. School of Public Health.
C. P. Straub.

RESOURCES DATA—Field 07

Evaluation, Processing and Publication—Group 7C

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 142-180, February 1973. 1 tab, 2 append. 14-31-0001-3823.

Descriptors: *Data storage and retrieval, *Data collections, *Hydrologic data, Geology, Hydrogeology, Data processing.

Information on State systems for the collection and retrieval of groundwater data was requested from the 50 States, Puerto Rico, and the Virgin Islands. In response to the initial enquiry, replies were received from 45 States and two territories. Only 10 States reported that they had automated data collection and retrieval systems or that such systems were under development. Three of these states were geared solely to the collection of water-resources information. Five states had cooperative collection and retrieval systems with the U.S. Geological Survey. A number of states indicated that a manual collection and data retrieval system was being used based on data files maintained over a considerable period of time. The data available on existing information systems, the analytical services available for characterizing the quality parameters of the water supplies, and other information are listed. There is no single agency in state government that is basically responsible for the collection and dissemination of data on groundwater quality. (See also W73-09113) (Knapp-USGS)

W74-00576

UTAH'S GROUND WATER QUALITY INFORMATION SYSTEM, Utah State Div. of Health, Salt Lake City. L. M. Thatcher.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 181-190, February 1973. 4 fig. 14-31-0001-3823.

Descriptors: *Utah, *Data storage and retrieval, *Hydrologic data, *Groundwater, Well data, Data processing, Water quality, Water management (Applied).

In Utah, environmental quality matters are within the Division of Health, with policy guidance of three statutory bodies: The State Board of Health, State Air Conservation Committee, and State Water Pollution Committee. Computerized inventories of water pollution sources and similar inventories of municipal water supplies are in use. Including quality and quantity characteristics of all individual sources contributing to these supplies will greatly enhance the value of computer records. Present procedure also includes publishing annually all chemical and radiological laboratory analysis information in chronological tabulation. Bacteriological analyses performed primarily on some 335 municipal supplies, and not identified as to source, are tabulated for each municipality on an annual basis to determine compliance with drinking water standards. A few separate groundwater sources may be monitored for coliforms if chlorination is depended on for purification and if there is some question about level of pollution. (See also W73-09113) (Knapp-USGS)

W74-00577

FEDERAL WATER INFORMATION SYSTEMS, Geological Survey, Washington, D.C. Office of Water Data Coordination. W. W. Doyel.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 191-209, February 1973. 8 fig. 18 ref. 14-31-0001-3823.

Descriptors: *Information exchange, *Data storage and retrieval, *Information retrieval, Data collections, Hydrologic data, Environment, Documentation, Networks, Land use, Planning, Management.

Systems are being developed to give information on the environment and assist in putting together all the facts and figures for proper decisionmaking. The National Water Data Exchange (NAWDEX) is an example of a decentralized system. Collector agencies act as ongoing data centers with little, if any, change in operating procedures. A combination of centralized and decentralized approaches is exemplified by the Resources and Land Information program (RALI) being developed within the Department of the Interior. This program will provide (1) a broad data acquisition capability; (2) a National Information System Network utilizing libraries as well as computer systems; and (3) interpretation, analysis, and translation of the data into products that are applicable by the user. The RALI program will operate with a national center in the Washington, D.C. area, regional centers, and links to state and local centers. The Geological Survey established the Office of Data Coordination (OWDC) in its Water Resources Division to carry out the coordinating, planning, and cataloging functions, to complement its function of data acquisition. The principal functions are: to design and operate a national network for acquiring water data; to organize the network data; to coordinate national network and specialized water data activities; to prepare an annual Federal Plan for acquisition of water data; and to maintain a central catalog of information. (See also W73-09113) (Knapp-USGS)

W74-00578

RELATION OF GROUND WATER QUALITY INFORMATION SYSTEM AND OTHER SYSTEMS IN MINNESOTA, Minnesota State Planning Agency, St. Paul. D. Hamernick.

In: Proceedings of Conference on Toward A Statewide Ground Water Quality Information System and Report of Ground Water Quality Subcommittee, Citizens Advisory Committee, Governors Environmental Quality Council: University of Minnesota Water Resources Research Center Mimeo-graphed Report, p 211-216, February 1973. 3 ref. 14-31-0001-3823.

Descriptors: *Information exchange, *Data storage and retrieval, *Minnesota, *Information retrieval, Data collections, Hydrologic data, Environment, Documentation, Networks, Land use, Planning, Management.

Several information systems are presently being developed by State agencies in Minnesota. The Minnesota Pollution Control Agency initiated data systems for river and air quality data and has access to a Federal system, STORET. The State Department of Health computerizes statistics of the past decade and has a system for dealing with municipal water quality data. The Minnesota State Planning Agency is sponsoring a data bank for land-use information and has completed a lake-shore inventory. To assure maximum compatibility between these systems, overall coordination through a central agency is necessary. The primary goal of the Minnesota Land Management Information System (MLMIS) Project is to improve the quality of public- and private-sector decisions about the environment. MLMIS is doing this by providing extensive information, previously

unavailable, on present land use and economic and social conditions. This means combining in compatible computer systems a broad range of data now collected routinely and maintained separately by government agencies in their regular licensing, regulating, and management functions. (See also W73-09113) (Knapp-USGS)

W74-00579

RIVER MILE INDEX—NAPA, SALINAS, AND EEL RIVER BASINS, CALIFORNIA. Federal Power Commission, San Francisco, Calif. Regional Office. For primary bibliographic entry see Field 02E. W74-00585

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 9. COLORADO RIVER BASIN—VOLUME 2. COLORADO RIVER BASIN FROM GREEN RIVER TO COMPACT POINT. Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C., 20402
Price \$3.20. Water-Supply Paper 2125, 1973. 634 p, 1 fig.

Descriptors: *Streamflow, *Flow measurement, *Hydrologic data, *Surface waters, *Colorado River basin, Basic data collections, Arizona, Colorado, New Mexico, Utah, Wyoming, Gaging stations, Flow rates, Average flow, Low flow, Peak discharge, Stream gages, Lakes, Reservoirs, Water levels, Crest-stage gages.

Identifiers: *Colorado River Basin (Wyo to N Mex).

This volume of surface water data for the Colorado River basin from Green River to Compact Point is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)

W74-00586

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS—VOL. 3. UPPER MISSISSIPPI RIVER BASIN BELOW KEOUK, IOWA. Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C. 20402
Price \$3.20. Water-Supply Paper 2115, 1973. 607 p, 1 fig.

Descriptors: *Streamflow, *Flow measurement, *Hydrologic data, *Surface waters, *Mississippi River basin, Basic data collections, Illinois, Indiana, Iowa, Minnesota, Missouri, Wisconsin, Gaging stations, Flow rates, Average flow, Low flow, Peak discharge, Stream gages, Crest-stage gages, Water levels, Lakes, Reservoirs.

Identifiers: *Upper Mississippi River Basin.

This volume of surface water data for the Upper Mississippi River basin below Keokuk, Iowa is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)

W74-00587

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN—VOLUME 4. OHIO RIVER BASIN BELOW WABASH RIVER.

Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C., 20402
Price \$3.70. Water-Supply Paper 2110, 1973. 806 p., 1 fig.

Descriptors: *Streamflow, *Flow measurement, *Hydrologic data, *Surface waters, *Ohio River, Basic data collections, Tributaries, Alabama, Georgia, Illinois, Kentucky, North Carolina, Tennessee, Virginia, Gaging stations, Flow rates, Lakes, Reservoirs, Water levels, Average flow, Low flow, Peak discharge, Stream gages, Crest-stage gages.

This volume of surface water data for Ohio River basin below Wabash River is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)

W74-00588

STREAMFLOW FORMATION, COMPUTATIONS, AND REGULATION (FOR MIROVANIYE, RASCHETY I REGILOVANIYE RECHNOGO STOKA).

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 04A.

W74-00592

PROBLEM OF SIMPLIFYING SNOWMELT COMPUTATIONS (K VOPROSU OB UPROSHCHENNOM RASCHETE SNEGOTAYANIYA),

Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR). For primary bibliographic entry see Field 02C.

W74-00596

SOME ASPECTS OF NONORTHOGONAL DATA ANALYSIS, PART II. COMPARISON OF MEANS,

Du Pont de Nemours (E. I.) and Co., Wilmington, Del.

R. D. Snee.

Journal of Quality Technology, Vol 5, No 3, p 109-119, July 1973. 3 fig, 8 tab.

Descriptors: *Regression analysis, Statistical methods, *Data processing.

Identifiers: *Analysis of covariance, *Missing data, *Comparison of means, Unequal replicates, Multiple regression.

Since the effects of factors and their interactions cannot be evaluated by the usual analysis of variance technique when there are unequal replicates of missing data, alternative methods are required. The use of multiple regression in the analysis of this type of data and analysis of covariance problems is discussed. Suggested procedures are illustrated. (Little-Battelle)

W74-00612

ESTIMATING A CORRELATION COEFFICIENT WHEN ONE VARIABLE IS NOT DIRECTLY OBSERVED,

Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Statistics.

L. S. Mayer.

Journal of the American Statistical Association, Vol 68, No 342, p 420-421, June 1973. 1 tab, 9 ref.

Descriptors: *Correlation analysis, Statistical methods.

Identifiers: *Correlation coefficients, *Monotonic transforms.

A simple method is presented for estimating the correlation between two bivariate normal variables when one variable is directly observed and a monotonic transform of the other variable is observed. The concept of best monotone regression is defined and a monotone correlation coefficient is introduced. It is shown that this coefficient is a consistent estimator of the true correlation between the two bivariate normal random variables. An application is presented. (Little-Battelle)

W74-00619

A SYSTEMATIC APPROACH TO THE ANALYSIS OF MEANS. PART I. ANALYSIS OF TREATMENT EFFECTS,

General Electric Co., Cleveland, Ohio.

E. G. Schilling.

Journal of Quality Technology, Vol 5, No 3, p 93-108, July 1973. 7 fig, 13 tab, 15 ref, 2 append.

Descriptors: *Statistical models, Data processing, Statistical methods.

Identifiers: *Data interpretation, *Analysis of means, Treatment effects, Algorithms, Crossed design, Incomplete block design, Nested design, Split-plot design, Experimental design.

The analysis of means is a method for the graphical analysis of the means resulting from a designed experiment. The basic procedure, which was developed by E. R. Ott of Rutgers University, has been extended. This part of the series provides an algorithm to simplify application of analysis of means, extends the analysis from the present crossed-fixed effects designs to other forms such as balanced incomplete blocks, and discusses the role of random factors. Several examples are included. (Little-Battelle)

W74-00626

SKIP-LOT SAMPLING PLANS,

Procter and Gamble Co., Cincinnati, Ohio.

R. L. Perry.

Journal of Quality Technology, Vol 5, No 3, p 123-130, July 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Quality control, *Inspection, Sampling, Statistical methods, Data processing.

Identifiers: *Skip-lot sampling, *Acceptance sampling, *Average sample number, Data interpretation, Average outgoing quality limit.

A system is presented of skip-lot sampling plans for lot-inspection where provision is made for skipping inspection of some of the lots when the quality of the submitted product is good. The operating characteristic properties are presented, as well as the plan's Average Sample Number (ASN), its response-to-change characteristics, and a measure of the Average Outgoing Quality Limit (AOQL) in terms of 'nonconforming' lots. (Little-Battelle)

W74-00627

ALTERNATING CURRENT POLAROGRAPHY IN THE HARMONIC MULTIPLEX MODE. OBSERVATIONS ON THE USE OF DIGITAL SIGNAL CONDITIONING WITH THE FAST FOURIER TRANSFORM ALGORITHM,

Northwestern Univ., Evanston, Ill. Dept. of Chemistry.

D. E. Gover, and D. E. Smith.

Analytical Chemistry, Vol 45, No 11, p 1869-1877, September 1973. 7 fig, 25 ref.

Descriptors: *Fourier analysis, *Instrumentation, *Data processing, Polarographic analysis, Efficiencies, Methodology, Data collections, Measurement, Cadmium, Zeta potential, Automatic control, Algorithms.

Identifiers: *AC polarography, *Fast Fourier transformation, Digital signal conditioning, *Data acquisition, Harmonic multiplex mode, Analog to digital converters, Chromic cyanide, Minicomputers.

Digital signal conditioning based on the Fast Fourier Transformation (FFT) is applied to ac polarography in the harmonic multiplex mode. The FFT is used in two capacities. First, it is applied to the discrete, digital representation of the cell current time domain waveform, which is obtained by analog-to-digital conversion. Through this operation, the digital FFT provides the means for separation and quantitative characterization of the direct current, fundamental harmonic alternating current, and second harmonic alternating current polarographic responses. Second, polarograms resulting from measurement of the response as a function of the dc potential are smoothed by a FFT smoothing technique. Results show that the foregoing digital signal conditioning scheme provides at least comparable measurement fidelity, together with superior efficiency and convenience, compared with a previously-described procedure which relies more heavily on analog signal conditioning. (Holoman-Battelle)

W74-00631

THE USE OF MINI COMPUTERS IN THE WATER INDUSTRY,

Kent Instruments Ltd., Luton (England).

B. L. Thurley.

Water and Water Engineering, Vol 77, No 927, p 165-169, May 1973. 3 fig.

Descriptors: *Control systems, *Automatic control, Computers, Data processing.

Identifiers: *Minicomputers.

Two minicomputers which are used in the water industry, the DEC PDP/8 and the MINIC are described, with brief comments on interfaces, peripherals, displays, and types of applications used and anticipated. Four separate installations using minicomputers in different modes are also described. (Little-Battelle)

W74-00666

PATHOLOGY OF A DYNAMIC PROGRAMMING SEQUENCING ALGORITHM,

Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.

For primary bibliographic entry see Field 06A.

W74-00671

ANNUAL STREAMFLOW SUMMARIES FROM FOUR SUBALPINE WATERSHEDS IN COLORADO,

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 03B.

W74-00676

RESOURCES DATA—Field 07

Evaluation, Processing and Publication—Group 7C

MICHIGAN WATER RESOURCES ENFORCEMENT AND INFORMATION SYSTEM,
Michigan Dept. of Natural Resources, Lansing.
Water Resources Commission.
For primary bibliographic entry see Field 05G.
W74-00701

GROUNDWATER SURVEY OF THE ERBIL PROJECT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W74-00761

FLOOD MANAGEMENT PLAN—WARNING, DAMAGE, COORDINATION.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 06F.
W74-00817

HEC-1, FLOOD HYDROGRAPH PACKAGE—USERS MANUAL, COMPUTER PROGRAM 723-X6-L2010.
Hydrologic Engineering Center, Davis, Calif.

January 1973. 186 p.

Descriptors: *Flood discharge, *Synthetic hydrology, *Systems analysis, *Computer models, *Computer programs, Input-output analysis, Methodology, Hydrographs, Hydrologic data, Forecasting, Statistical methods, Computers, Flood routing, Rainfall-runoff relationships, Flood damage, Watersheds(Basins).
Identifiers: Fortran IV.

This computer program represents a major revision of the October 1970 version of the Flood Hydrograph Package, HEC-1. The computational methods used by the program remain basically unchanged; however, the input and output formats have been almost completely restructured. These changes were made in order to simplify input requirements and to make the program output more meaningful and readable. The program is capable of performing five major types of flood hydrograph analyses: (1) optimization of routing parameters; (2) optimization of unit hydrograph and loss rate parameters; (3) generalized precipitation, runoff, routing and combining operations to simulate the hydrologic response of a watershed and its stream network; (4) stream system computations for specified precipitation depth-area storm relationships for the entire watershed or region; and (5) specialized precipitation streamflow network simulation relative to multiple floods for multiple plans of basin development and the economic analysis of flood damages. This version of the Flood Hydrograph Package has been developed and tested primarily on the UNIVAC 1108 and the Control Data Corporation 6600 computer systems. It was then adapted for use of the GE 400 series computers. (Woodard-USGS)
W74-00821

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—USERS MANUAL.
Hydrologic Engineering Center, Davis, Calif.

February 1972. 134 p.

Descriptors: *Streamflow forecasting, *Flood forecasting, *Systems analysis, *Computer programs, *Synthetic hydrology, Flood profiles, Computers, Computer models, Methodology, Environmental effects, Engineering structures, Hydraulic structures, Bridges, Culverts, Weirs, Embankments, Dams, Flood control.
Identifiers: Fortran IV.

This computer program (723-X6-L202A) is a modification of program 723-G2-L214A (first issue

dated December 1968) developed in The Hydrologic Engineering Center. The program computes and plots (by printer) the water surface profile for river channels of any cross section for either subcritical or supercritical flow conditions. The effects of various hydraulic structures such as bridges, culverts, weirs, embankments, and dams may be considered in the computation. The principal use of the program is for determining profiles for various frequency floods for both natural and modified conditions. The latter may include channel improvements, levees and floodways. Input may be in either English or Metric units. The program was written for use in the CDC 6600 computer but may be used with minor modifications on other high-speed computers having four or more magnetic tapes plus input and output units such as the IBM 360, IBM 7094, and GE 437. Various versions of the original program 723-G2-L214A can be used on smaller computers such as the IBM 1620, GE 225, and IBM 1130. (See also W74-00823) (Woodard-USGS)
W74-00822

COMPUTER PROGRAM 723-X6-L202A, HEC-2, WATER SURFACE PROFILES—PROGRAMMERS MANUAL.
Hydrologic Engineering Center, Davis, Calif.

June 1973. 188 p, 7 fig, 4 tab.

Descriptors: *Streamflow forecasting, *Flood forecasting, *Systems analysis, *Computer programs, *Synthetic hydrology, Flood profiles, Computers, Computer models, Methodology, Environmental effects, Engineering structures, Hydraulic structures, Bridges, Culverts, Weirs, Embankments, Dams, Flood control.
Identifiers: Fortran IV.

This computer program (723-X6-L202A) is a modification of the 1964-1968 (first publication dated 1968) versions of program 723-G2-L214A (formerly 22-J2-L212), developed in the Hydrologic Engineering Center. The program computes and plots (by printer) the water surface profile for river channels of any cross section for either subcritical or supercritical flow conditions. The effects of various hydraulic structures such as bridges, culverts, weirs, embankments, and dams may be considered in the computation. The principal use of the program is for determining profiles for various frequency floods for both natural and modified conditions. The latter may include channel improvements, levees and floodways. Input may be in either English or Metric units. A supplementary program (723-G1-L202B) is available to convert input data prepared for the older program 723-G2-L214A for use in the new program. A data edit program (723-G1-L202C) which reads the data cards for the new program 723-X6-L202A and checks the data for various input errors is also available. The program was written for use on various high-speed computers having four or more magnetic tapes, plus input and output units, such as the IBM 360/50, UNIVAC 1108, GE 437, and CDC 6600. Various versions of the original program 723-G2-L214A can be used on smaller computers such as the IBM 1620, GE 225, and IBM 1130. (See also W74-00822) (Woodard-USGS)
W74-00823

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 1. SURFACE WATER RECORDS.
Geological Survey, Albany, N.Y.

Basic Data report, 1973. 313 p, 14 fig, 3 ref.

Descriptors: *Water resources, *Surface waters, *New York, *Streamflow, *Flow measurement, Flow rates, Hydrologic data, Basic data collections, Gaging stations, Stream gages, Water yield, Lakes, Reservoirs, Water levels, Elevation, Inflow, Discharge (Water), Crest-stage gages.
Identifiers: *Surface water records (NY).

Surface-water records for the 1972 water year are presented for New York, including records of streamflow, reservoir storage or lake elevations at gaging stations, partial record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering states are also included. These data represent that portion of the National Water Data System collected by the U. S. Geological Survey and cooperating state and federal agencies in New York. The tables of data include daily discharge records for 206 gaging stations; daily or monthly data on stage or contents for 44 lakes and reservoirs; discharge measurements for 434 sites, 188 of which are low-flow, partial-record stations and the remainder, miscellaneous sites; and annual maximum stages and discharges for 123 crest-stage, partial-record stations. (Woodard-USGS)
W74-00825

ESTUARIES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
E. F. Colon.

Available from the National Technical Information Service as PB-224 871, \$3.00 in paper copy, \$1.45 in microfiche. Partial Completion Report No. 8 (UPRICO-WRRI-PR-71-31-8), May 1972. 40 p. OWRR A-031-PR (8).

Descriptors: *Currents (Water), Coasts, *Ocean currents, *Bays, *Estuaries, *Puerto Rico, Data collections, Measurement, Instrumentation.

Three model 502 In-situ Current direction, temperature, and velocity meters, manufactured by Hydro Products in California were used simultaneously in a triangular pattern or in line. In some cases, all three instruments were used vertically at different depths. A one half moon cycle period was taken for each station and a continuous recording was obtained for all three instruments. This data is shown by vectors every 10 degrees on a magnetic rose and in tabular form indicating the relative volume of water passing through the station every 10 degrees during the entire study period.
W74-00832

REGIONAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla. Environmental Health Div.
For primary bibliographic entry see Field 05B.
W74-00849

OPTIMAL ALLOCATION OF ARTIFICIAL AERATION ALONG A POLLUTED STREAM USING DYNAMIC PROGRAMMING,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 05G.
W74-00883

CHESAPEAKE BAY EXISTING CONDITIONS REPORT, APPENDIX D—MAP FOLIO.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 02L.
W74-00924

DYNAMIC WATER QUALITY FORECASTING AND MANAGEMENT,
Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W74-00927

METHODS OF COLLECTING AND INTERPRETING GROUND-WATER DATA.
Geological Survey, Washington, D.C.

Geological Survey Water Supply Paper 1544-H, Compiled by R. Bentall. 1963, 97 p, 26 fig, 20 tab.

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

Descriptors: Groundwater resources, Drillers' logs, *Sampling, Logging (Recording), Observation wells, *Water level recorders, Water level fluctuations, Permeability, Induced infiltration, Artesian aquifers, Management, Ground water movement, Methodology.

Identifiers: Deep aquifers, Shallow aquifers, *Groundwater velocity, Groundwater temperature, Streambed percolation.

Six papers pertaining to widely differing phases of ground water investigation comprise this contribution. The first paper describes methods of collecting, examining, and describing rock cuttings and some of the uses made of subsurface information obtained by drilling. Equipment used and the procedure followed in installing shallow water-level observation wells by a combination of jetting and rotary-drilling methods is described in the second paper. The phenomenon of reverse water-level fluctuations is discussed in the third paper. The fourth paper relates the distribution of underground temperatures to the velocity of the ground water. Factors that should be considered in designing a water-supply installation that is to be supplied by stream bed percolation are discussed in the fifth paper. In the sixth paper a long-term record of water-level fluctuations in a single well is used as the basis for developing a water budget for the artesian aquifer tapped by the well. (Campbell-NWWA)

W74-00929

WHAT YOU SHOULD KNOW ABOUT PUMPING TESTS. TECHNICAL MEMO NO. 1,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 08G.
W74-00933

THE HARVARD PROGRAM: A SUMMING UP,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 06B.
W74-01030

STREAM AND LAKEFRONT FIELD INVENTORY, VOLUME I - SUMMARY.
Lorain County Regional Planning Commission, Elyria, Ohio.
For primary bibliographic entry see Field 05B.
W74-01046

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1971 WATER YEAR,
Geological Survey, Austin, Tex.
J. A. Schulze, A. J. Dupuy, and E. McPherson.
Texas Water Development Board Report 176, August 1973. 268 p, 2 fig, 152 tab, 13 ref.

Descriptors: *Water quality, *Water analysis, *Texas, *Surface waters, *Chemical analysis, Inorganic compounds, Organic compounds, Nutrients, Biochemical oxygen demand, Dissolved oxygen, Pesticides, Water temperature, Basic data collections, Gaging stations, Streamflow, Flow rates.

Data collected by the U.S. Geological Survey from a network of daily and periodic chemical-quality stations on streams in Texas are presented for the 1971 year. The program is in cooperation with the Texas Water Development Board and other State, federal, and local agencies. To supplement the information being obtained on the inorganic quality of the surface-water resources, determinations of BOD, dissolved oxygen, selected nutrients, and pesticides were made at selected sites on streams throughout the State. Water-quality records are tabulated by station according to standard stream order, progressing downstream within each river basin and in clockwise river basin sequence beginning with the most northerly river basin. Records for stations on tributaries are listed between stations on the main stream in the order in

which those tributaries enter the main stream. (Woodard-USGS)
W74-01086

HEC-4, MONTHLY STREAMFLOW SIMULATION, COMPUTER PROGRAM 723-X6-L2340.
Hydrologic Engineering Center, Davis, Calif.

Generalized Computer Program 723-340, February 1971. 97 p.

Descriptors: *Streamflow forecasting, *Flow rates, *Synthetic hydrology, *Systems analysis, *Computer models, Computer programs, Input-output analysis, Methodology, Monthly, Hydrologic data, Statistical methods.

Identifiers: Fortran IV.

This streamflow-simulation computer program was prepared in The Hydrologic Engineering Center, Corps of Engineers. The program will analyze monthly streamflows at a number of interrelated stations to determine their statistical characteristics and will generate a sequence of hypothetical streamflows of any desired length having those characteristics. It will reconstitute missing streamflows on the basis of concurrent flows observed at other locations and will obtain maximum and minimum quantities for each month and for specified durations in the recorded, reconstituted and generated flows. It also will use the generalized simulation model for generating monthly streamflows at ungauged locations based on regional studies. There are many options of using the program for various related purposes, and it can be used for other variables such as rainfall, evaporation, and water requirements, alone or in combination. This program requires a FORTRAN IV compiler, a random number generator, and a fairly large memory. (Woodard-USGS)
W74-01091

08. ENGINEERING WORKS

8A. Structures

ENGINEERING REPORT ON SPECIAL ASSESSMENT STORM SEWER DISTRICT FOR THE NORTHEAST INDUSTRIAL DISTRICT, CITY OF KANSAS CITY, MISSOURI.
Riddle Engineering, Inc., Kansas City, Mo.

Kansas City Department of Public Works, Kansas City, Missouri, June 9, 1972. 52 p, 10 fig, 8 tab, 8 append.

Descriptors: *Sewers, *Storm drains, *Separated sewers, *Urban drainage, Urbanization, Outfall sewers, Missouri, Costs, Construction costs, Bonding, Urban hydrology.
Identifiers: *Kansas City (Missouri).

The Northeast Industrial District of Kansas City, Missouri, is a rapidly developing area that is experiencing problems of flooding from urban drainage. The District covers 355 acres of flat river bottom land in the Missouri River bottoms. Although protected by flooding from the Missouri River by levees, the area has problems of street flooding due to an inadequate drainage system. No major flooding damages occur in the area, primarily because basements are either non-existent, or are protected by waterproofing. The study inventoried existing systems and outlined criteria and design schemes for improvements. It was recommended that a design storm of the 2-year frequency be used. Total costs for the system range from between \$2.1 million and \$6.6 million, with the recommended system costing \$4.6 million. This plan includes an all-gravity collection system with discharge to the Missouri River. Such a plan would: improve the economic conditions of the area by reducing impediments to traffic, have the

highest benefit-cost ratio, and be the easiest system to construct. Other recommendation include regrading of portions of the street and enforcement of local building codes to reduce flood damages. (Poertner)
W74-00802

PRELIMINARY STUDY FOR CENTRAL INDUSTRIAL DISTRICT SEWERS, DEPARTMENT OF PUBLIC WORKS, KANSAS CITY, MISSOURI.
Shafer, Kline and Warren, Kansas City, Mo.

Kansas City Department of Public Works, Kansas City, Missouri, 1972. 28 p, 4 fig, 2 tab.

Descriptors: *Sewers, *Separated sewers, *Storm drains, *Urban drainage, Urbanization, Pumping plants, Outfall sewers, Missouri, Costs, Construction costs, Sewerage, Urban hydrology, Bonding.
Identifiers: *Kansas City (Missouri).

The location and condition were studied of existing storm sewers in the Central Industrial District of Kansas City, Missouri, and recommendations were made for supplemental sewers. Supplemental sewers are needed to eliminate surcharging of the present system which has caused both surface and basement flooding. The existing sewers were primarily of sound construction, having been built in the late 1800's. Alignment and structural strength is still good. But many of the trunk sewers are constructed of stone or brick, and the coefficient of roughness is too high for efficient operation, today. In addition, the sewers are, in some places, almost level, while in their lower extremities they have excessive slope. The combined sewage is carried by gravity to pumping stations, where it is pumped to treatment plants during dry weather. By-passes of sewer flows at the pumping station discharge into the Kansas and Missouri Rivers during periods of surcharge. A four-phase program of construction costing a total of \$5.3 million was recommended. A 10-year storm was chosen for design purposes and the Rational Formula was selected for making computation of stormwater runoff rates. (Poertner)
W74-00803

FLOOD STUDIES FOR SAFETY OF TVA NUCLEAR PLANTS: HYDROLOGIC AND EMBANKMENT BREACHING ANALYSIS,
Tennessee Valley Authority, Knoxville.

D. W. Newton, and M. W. Cripe.
Paper presented at American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29 - February 2, 1973. 37 p, 12 fig, 2 tab, 12 ref.

Descriptors: *Nuclear power plants, *Flood forecasting, *Tennessee Valley Authority, *Safety, Dam failure, Probable maximum precipitation, Flood routing, Flood recurrence intervals, Flood protection, Maximum probable flood, Flood profiles, Flood damage.

Design standards for nuclear power plants contain provisions for plant safety for the maximum possible flood. This in turn requires accurate determination of maximum floods. A TVA nuclear power plant was analyzed for the maximum probable flood under a variety of flood-causing conditions. Flood levels were examined for conditions of upstream dam failure by embankment breaching or by seismic failure, under assumed conditions of the probable maximum precipitation creating the probable maximum flood. It was found that seismic failure of upstream dams would not cause the worst flood conditions. Breaching of a dam embankment, followed by total failure of the dam, would cause the worst possible flood. The rate of dam failure was computed by assuming that overflow had begun at a notch of a specified size. However, theories on overtopping of embankments are not well developed and some quantities had to be assumed for flood analysis. A rough probability

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analysis was performed, and the probability of the conditions of dam failure under the probable maximum precipitation producing the probable maximum flood was estimated to be extremely remote. (Poertner)
W74-00805

INSTITUTIONAL IMPLICATIONS OF DEEP-WATER PORTS.

Institute for Water Resources (Army), Alexandria, Va.

Report, June 1973. 14 p.

Descriptors: *Harbors, *Engineering structures, *Design criteria, *Ships, Reviews, Rivers and Harbors Act, Water quality control, Dredging, Navigation, Oil industry, Oil spills, Economics, Planning, Administrative decisions, Federal Government.

Identifiers: *Deepwater ports.

Federal responsibility for planning, constructing, and maintaining harbor and channel depths, and responsibility for reviewing and issuing permits for non-Federal developments in navigable waters of the United States resides primarily with the Army Corps of Engineers. As a result, the Corps of Engineers is concerned with the recent and rapid increases in ship size and water depth requirements. The Institute for Water Resources contracted with Robert R. Nathan Associates for a study of "... the institutional implications of planning, constructing and operating U.S. deep harbors..." in August 1972. The report was completed in June 1973. (Copies will be available from National Technical Information Service, Department of Commerce, Springfield, Virginia 22151.) This summary of the major findings and conclusions of the report was prepared to fill the immediate need of interested parties for information on the principal results of the study, particularly in the light of current attention to deepwater port problems by the Executive Branch, Congress, State and local governments, and the petroleum and related industries. (Woodard-USGS)
W74-00820

CONSIDERATION OF THE CHARACTER OF SURFACE-GROUNDWATER RELATIONSHIPS AND STREAMFLOW IN ESTIMATES OF YIELDS FROM INFILTRATION GALLERIES (UCHET KHLAKTERA SVYAZI PODZEMNYKH VOD S POVERKHOSTNYYMI I REZHIMA RECHNOGO STOKA PRI RASCHETAKH INF IL'TRATSIONNYKH VODOZABOROV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
Ye. L. Minkin, and B. M. Zil'bershteyn.
Vodnyye Resursy, No 1, p 186-201, 1973. 6 fig, 4 tab, 5 ref.

Descriptors: *Infiltration galleries, *Infiltration, *Surface-groundwater relationships, *Streamflow, *Estimating, Rivers, Valleys, Channels, Water wells, Water levels, Drawdown, Aquifers, Model studies, Analog models, Unsteady flow, Equations, Water yield.
Identifiers: USSR.

New procedures are described for simple analytical computation of yields from horizontal conduits in river valleys. Allowance is made for surface runoff, possible changes in the character of surface-groundwater relationships, resistance of channel deposits to infiltration, and differences in infiltration properties of alluvium and bedrock comprising the valley sides. To check applicability of the working relations proposed, analog modeling was performed on the ABM MCM-1 equipped to simulate unsteady flow. Good agreement was obtained from a comparison of the results of analytical computations and modeling of 5 typical variants. (Josefson-USGS)
W74-00848

PROJECTS PROPOSED FOR INCLUSION IN OMNIBUS RIVER AND HARBOR AND FLOOD CONTROL LEGISLATION—1972.

For primary bibliographic entry see Field 06E.
W74-00872

LOST CREEK WATERSHED, NEWTON COUNTY, MISSOURI (FINAL ENVIRONMENTAL STATEMENT).

Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W74-00880

GILLHAM LAKE, COSSATOT RIVER ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00881

GILLHAM LAKE, COSSATOT RIVER, ARKANSAS, APPENDIX II (PHOTOGRAPHS), APPENDIX III (ENVIRONMENTAL ELEMENTS), (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W74-00882

DESIGN OF SMALL DAMS.

Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

Available from GPO, Wash, D.C. 20402 on Bur. of Reclamation, Denver Federal Center, Denver, Colo. 80225, Atten: 922 Price \$12.65. A Water Resources Technical Publication. 1973 (second edition). 816 p.

Descriptors: *Project planning, *Dams, *Reservoir design, *Dam design, Benefits, Cost-benefit analysis, Feasibility studies, Project feasibility, Dam construction, Hydraulics, Streamflow forecasting, Dam foundations, Ecology.
Identifiers: *Small dams.

Instructions, standards, and procedures are presented for use in the design of small dams. They are intended to serve primarily as a guide to safe practices for those concerned with the design of small dams in public works programs in the United States. The book will serve this purpose in three ways: (1) It will provide engineers with information and data necessary for the proper design of small dams, (2) it will provide specialized and highly technical knowledge concerning the design of small dams in a form that can be used readily by engineers who do not specialize in this field, and (3) it will simplify design procedures for small earthfill dams. Damete gravity, earthfill (rolled-type), and rockfill dams. Emphasis is placed on the design of rolled earthfill dams because they are the most common type. Simplified design methods are given to avoid the complex procedures and special investigations required for large dams or for unusual conditions. Adequate but not unduly conservative factors of safety are used in the simplified design methods. See also W74-01059 thru W74-01070 (Knapp-USGS)
W74-01058

PROJECT PLANNING,
Bureau of Reclamation, Denver, Colo. Div. of Project Investigations.
A. F. Johnson.

In: Design of Small Dams; A Water Resources Technical Publication, p 1-19, 1973 (second edition). 3 ref.

Descriptors: *Project planning, *Dams, *Reservoir design, *Dam design, Benefits, Cost-benefit analysis, Feasibility studies, Project feasibility, Dam construction, Hydraulics, Streamflow forecasting, Dam foundations, Ecology.

Identifiers: *Small dams.

The investigations and studies made for dams must be considered in relation to the function they perform in accomplishing the purposes of the project as a whole. Each project purpose and each increment of its size or scope must justify inclusion in the project by some appropriate measure of feasibility or justification which is usually related to the benefits it produces, the need it serves, or the investment it can repay with or without interest. Feasibility studies of dams and reservoirs should always consider possible objections from a public health and nuisance standpoint. The environmental and ecological aspects of the project should be studied and provisions made to minimize any deleterious effects. (See also W74-01058) (Knapp-USGS)
W74-01059

ECOLOGICAL AND ENVIRONMENTAL CONSIDERATIONS,

Bureau of Reclamation, Denver, Colo.
E. A. Seaman, and L. W. Davidson.
In: Design of Small Dams; A Water Resotion, p 21-36, 1973 (second edition). 14 fig, 30 ref.

Descriptors: *Reservoir design, *Project planning, *Dams, Ecology, Recreation, Environment, *Environmental effects, Dam design.

Identifiers: Small dams.

One of the most important aspects of dealing correctly and completely with the ecological and environmental impact of any structure is proper planning. If possible, an environmental team should be formed of representatives from groups who will be affected by the structure and experts from various scientific fields who can contribute their ideas and experience. The placement of a dam or canal within the environment should be done with due consideration of the effects on the fish and wildlife populations of the specific area. Provisions should be made to obtain the maximum recreational benefits from the completed reservoir and a future development plan should provide for area modifications as the recreation use increases. (See also W74-01058) (Knapp-USGS)
W74-01060

FLOOD STUDIES,

Bureau of Reclamation, Denver, Colo. Flood Hydrology Section.
D. L. Miller, R. A. Clark, and S. Schamach.
In: Design of Small Dams; A Water Resources Technical Publication, p 37-95, 1973 (second edition). 22 fig, 7 tab, 68 ref.

Descriptors: *Design flood, *Reservoir design, *Dam design, Hydrograph analysis, Design storm, Streamflow forecasting, Rainfall-runoff relationships, Probable maximum precipitation, Maximum probable flood.
Identifiers: Small dams.

Methods are given for determining the floodflows to be expected from the drainage area tributary to the reservoir site, for which provision must be made in the design of a dam. In most instances, particularly for structures impounding considerable storage, the inflow design flood is the maximum probable flood, which is defined as the largest flood that can reasonably be expected to occur on a given stream at a selected point. Determination of the flood is based on rational consideration of the chances of simultaneous occurrence of the maximum of the several elements or conditions which contribute to the flood. A major consideration is the determination of the runoff that would result from an occurrence of a probable maximum storm based on meteorological factors. This hydroeteorological approach is necessary because streamflow records are of such relatively short duration in the United States that statistical analyses thereof do not provide reliable bases for estimates of maximum probable floodflows.

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Group 8A—Structures

Methods of determining the magnitude and frequency of floods as indicated by statistical analyses of streamflow records are primarily for use in connection with estimating diversion requirements during construction, establishing frequency of use of emergency spillways used in conjunction with outlets or small spillways, determining peak discharge estimates for diversion dams, or providing other information useful to the designers. (See also W74-01058) (Knapp-USGS) W74-01061

SELECTION OF TYPE OF DAM,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.

H. G. Arthur.

In: Design of Small Dams; A Water Resources Technical Publication, p 97-105, 1973 (second edition). 4 fig.

Descriptors: *Dams, *Reservoir design, *Dam design, Legal aspects, Economics, Cost-benefit analysis, Dam construction, Planning.

Identifiers: Small dams.

Dams may be classified into a number of different categories, depending upon the purpose of the classification. For the purposes of choosing which to use, it is convenient to consider three broad classifications according to use, hydraulic design, or materials of the structure. It is only in exceptional circumstances that an experienced designer can say that only one type of dam is suitable or most economical for a given damsite. Except in cases where the selection of type is obvious, preliminary designs and estuaries for several types of dams before one can be shown to be most economical. The selection of the best type of dam for a particular site calls for thorough consideration of the characteristics of each type, as related to the physical features of the site and the adaptation to the purposes the dam is supposed to serve, as well as economy, safety, legal and esthetic limitations. Usually, the greatest single factor determining the final choice of type of dam will be the cost of construction. (See also W74-01058) (Knapp-USGS) W74-01062

FOUNDATIONS AND CONSTRUCTION MATERIALS,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.

J. W. Hilt.

In: Design of Small Dams; A Water Resources Technical Publication, p 107-204, 1973 (second edition). 68 fig, 6 tab, 18 ref.

Descriptors: *Dams, *Dam design, *Construction materials, *Foundation investigations, Dam foundations, Foundation rocks, Soil investigation, Earth materials.

Information relating to foundation conditions and to the natural materials available for construction is essential for the design of small dams. For efficiency, the search for data must be properly planned. Subsurface explorations should not be started until all available geological and soils data have been evaluated. The investigator should know how to classify soils and rocks and should have an understanding of the geological and engineering characteristics of landforms. This background and a knowledge of the capabilities and limitations of the various methods of subsurface exploration will lead to selection of the most appropriate field methods, thereby avoiding time and effort lost through ineffectual procedures. The investigator should be familiar with logging and sampling methods and with the field and laboratory tests used for small dams. Procedures for investigation of foundations and of the various types of construction materials are given in detail. (See also W74-01058) (Knapp-USGS) W74-01063

EARTHFILL DAMS,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.

H. G. Arthur.

In: Design of Small Dams; A Water Resources Technical Publication, p 205-299, 1973 (second edition). 83 fig, 7 tab, 69 ref.

Descriptors: *Dam design, *Dam construction, *Earth dams, Earth materials, Soil mechanics, Dam foundations, Construction materials.

Design procedures are given for small earthfill dams which are of the rolled-fill type of construction is now being used almost entirely for the construction of small dams, to the exclusion of semihydraulic and hydraulic fills. Procedures for the design of earthfill dams include (1) thorough preconstruction investigations of foundation conditions and materials of construction; (2) application of engineering skill and technique to design; and (3) carefully planned and controlled method of construction. Proper construction methods include adequate foundation preparation and the placement of materials in the dam embankment with the necessary degree of compaction under an established procedure of testing and control. (See also W74-01058) (Knapp-USGS) W74-01064

ROCKFILL DAMS,
Bureau of Reclamation, Denver, Colo. Earth Dams Section.

R. W. Bock, and L. W. Davidson.

In: Design of Small Dams; A Water Resources Technical Publication, p 301-328, 1973 (second edition). 23 fig, 44 ref.

Descriptors: *Rockfill dams, *Dam design, Dam construction, Dam foundations, Construction materials, Rockfill, Earth materials.

Rockfill dams can prove economical when any of the following conditions exist: (1) large quantities of rock are readily available or will be excavated in connection with the project such as from a spillway or tunnel; (2) earthfill materials are difficult to obtain or require extensive processing to be used; (3) seasons prevail; (4) excessively wet climatic conditions limit the placement of large quantities of earthfill material; or (5) the dam is to be raised at a later date. In addition, uplift pressures and erosion due to seepage through the rockfill material do not generally constitute significant design problems. An impervious membrane is used as the water barrier and can be placed either within the embankment or on the upstream slope. Rockfill dams may be classified into three groups, depending on the location of the membrane, as follows: (1) central core, (2) sloping core, and (3) upstream membrane. (See also W74-01058) (Knapp-USGS) W74-01065

CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Hydraulic Structures Branch.

A. T. Lewis, J. S. Conrad, L. M. Christiansen, and

E. L. Watson.

In: Design of Small Dams; A Water Resources Technical Publication, p 329-344, 1973 (second edition). 11 fig, 9 ref.

Descriptors: *Gravity dams, *Concrete dams, *Dam design, Dam design, Dam construction, Stress, Reservoir design.

A concrete gravity dam is a structure proportioned so that its own weight provides the major resistance to the forces exerted upon it. The forces which act on concrete gravity dams and the requirements for stability are discussed. Additional considerations in connection with concrete structures on pervious (soil) foundations are presented and current practices regarding miscellaneous details of design are briefly described. (See also W74-01058) (Knapp-USGS) W74-01066

SPILLWAYS,

Bureau of Reclamation, Denver, Colo. Spillways and Outlet Works Section.

C. J. Hoffman.

In: Design of Small Dams; A Water Resources Technical Publication, p 345-447, 1973 (second edition). 73 fig, 12 tab, 25 ref.

Descriptors: *Dam design, *Spillways, *Design flow, Hydraulics, Dam construction, Overflow, Flood forecasting, Streamflow forecasting, Spillway crests, Drops (Structures).

Spillways are provided for storage and detention dams to release surplus or floodwater which cannot be contained in the allotted storage space, and at diversion dams to bypass flows exceeding those which are turned into the diversion system. Ordinarily, the excess is drawn from the top of the pool created by the dam and conveyed through an artificial waterway back to the river or to some natural drainage channel. Ample capacity is of paramount importance for earthfill and rockfill dams, which are likely to be destroyed if overtopped, whereas concrete dams may be able to withstand moderate overtopping. In addition to providing sufficient capacity, the spillway must be hydraulically and structurally adequate and must be located so that spillway discharges will not erode or undermine the downstream toe of the dam. The spillway's bounding surfaces must be erosion resistant to withstand the high scouring velocities created by the drop from the reservoir surface to tailwater, and usually some device will be required for dissipation of energy at the bottom of the drop. The frequency of spillway use will be determined by the runoff characteristics of the drainage area and by the nature of the development. (See also W74-01058) (Knapp-USGS) W74-01067

OUTLET WORKS,

Bureau of Reclamation, Denver, Colo. Spillways and Outlet Works Section.

C. J. Hoffman.

In: Design of Small Dams; A Water Resources Technical Publication, p 449-505, 1973 (second edition). 69 fig, 5 tab, 12 ref.

Descriptors: *Dam design, *Outlet works, Hydraulics, Dam construction, Outlets, Spillways.

An outlet works serves to regulate or release water impounded by a dam. It may release incoming flows at a retarded rate, as in the case of a detention dam; divert incoming flows into canals or pipelines, as in the case of a diversion dam; or release stored waters at such rates as may be dictated by downstream needs, evacuation considerations, or a combination of multiple-purpose requirements. The hydraulics of outlet works usually involve either one or both of two conditions of flow—open channel (or free) flow and full conduit (or pressure) flow. Analysis of open channel flow in outlet works, either in an open waterway or in a part full conduit, is based on the principle of steady nonuniform flow conforming to the law of conservation of energy. Full pipe flow in closed conduits is based on pressure flow, which involves a study of hydraulic losses to determine the total heads needed to produce the required discharges. Hydraulic jump basins, baffle or impact block dissipators, or other stilling devices normally are employed to dissipate the energy of flow at the downstream end of the outlet works. (See also W74-01058) (Knapp-USGS) W74-01068

DIVERSION DURING CONSTRUCTION,

Bureau of Reclamation, Denver, Colo. Earth Dams Section.

E. R. Lewandowski.

In: Design of Small Dams; A Water Resources Technical Publication, p 507-519, 1973 (second edition). 11 fig, 2 ref.

ENGINEERING WORKS—Field 08

Hydraulics—Group 8B

Descriptors: *Dam construction, *Diversion structures, Dam design, Chutes, Diversion tunnels, Dams, Hydraulic structures, Streamflow forecasting, Design flood.

The design for a dam which is to be constructed across a stream channel must consider diversion of the streamflow around or through the damsite during the construction period. The extent of the diversion problems will vary with the size and flood potential of the stream; at some damsites diversion may be costly and time consuming and may affect the scheduling of construction activities, while at other sites it may not offer any great difficulties. The scheme selected ordinarily will represent a compromise between the cost of the diversion facilities and the amount of risk involved. The proper diversion plan will minimize serious potential flood damage to the work in progress at a minimum of expense. The following factors should be considered in a study to determine the best diversion scheme: characteristics of streamflow; size and frequency of diversion flood; methods of diversion; and specifications requirements. (See also W74-01058) (Knapp-USGS) W74-01069

MAINTENANCE AND OPERATION,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.
H. G. Arthur.

In: Design of Small Dams; A Water Resources Technical Publication, p 521-525, 1973 (second edition).

Descriptors: *Reservoir operation, *Maintenance, *Operation and maintenance, Dams, Dam construction.

Identifiers: Dam maintenance.

Arrangements should be made, immediately following the completion of a dam, for periodic inspection of the structure and all of the operating equipment. Written instructions for maintenance and operation of the structures and equipment should be prepared as part of the design function and furnished to the owner or operating agency. These instructions should establish the frequency of and describe the extent and nature of inspections. The instructions should also provide for the routine servicing of mechanical equipment where gates and valves are provided, and should include such instructions furnished by the manufacturer. The instructions should also include detailed discussions of the proper operation of gates and valves from both mechanical and functional viewpoints. If a spillway is controlled by manually operated gates, specific instructions should be given regarding the operation of the gates during flood inflows into the reservoir. (See also W74-01058) (Knapp-USGS) W74-01070

RIPRAP SLOPE PROTECTION FOR EARTH DAMS: A REVIEW OF PRACTICES AND PROCEDURES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08D.
W74-01093

8B. Hydraulics

NUMERICAL SIMULATION OF UNSTEADY FLOWS IN RIVERS AND RESERVOIRS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein.

Available from NTIS, Springfield, Va. 22151 as COM-73-10674 Price \$3.00 printed copy; \$1.45 microfiche. Contract Report to National Weather Service, December 31, 1972. 73 p, 26 fig, 10 tab, 19 ref. NOAA-NWS Contract 0-3528.

Descriptors: *Open channel flow, *Unsteady flow, *Fluid mechanics, Rivers, Reservoirs, Channel flow, Numerical analysis, Analytical techniques, Equations, Model studies, Flood flow, Low flow, Channel morphology, Streamflow forecasting.

Unsteady flow in rivers and reservoirs is computed by numerical simulation of the equations of unsteady flow in open channels consisting of the equations for the conservation of mass and momentum. The simulation is based on an implicit finite difference representation of the primary partial differential equations using a centered difference scheme for distance and a forward difference scheme in time. The finite difference equations are nonlinear and are solved by Newton iteration method. Applications are given to slowly varied and rapidly varied flows in natural channels and reservoirs. The size of the time step was determined by the nature of the problem ranging from 3 minutes for rapidly varied discharge to several hours for floodflows of long duration. There is excellent agreement between observed and computed values. (Woodard-USGS) W74-00816

ERRORS IN PIEZOMETRIC MEASUREMENT,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 08G.
W74-00931

MODIFIED SOLUTIONS FOR DECREASING DISCHARGE WELLS,

California Univ., Davis. Dept. of Irrigation.
M. A. Abu-Zied, V. H. Scorr, and G. Aron.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 90, No. HY6, p 145-160, November, 1964. 8 fig, 5 tab, 1 append.

Descriptors: *Wells, Groundwater, Aquifer characteristics, Transmissivity, Drawdown, Water yield, Water storage.

Identifiers: *Nonsteady flow conditions, Steady flow condition, Theis method, Jacob method, *Artesian aquifer.

Several modified solutions are proposed for the problem of nonsteady flow to a well of decreasing discharge which completely penetrates an extensive artesian aquifer. The solutions reduce the computations required in using a general solution. A particular modified solution depends on the magnitude of the discharge and aquifer characteristics. Field data, obtained from an experimental well operating at decreasing discharge, were used to test the validity of the general and modified solutions for the aquifer characteristics. For comparison, Theis' and Jacob's methods for steady flow conditions were applied to the same well test data, and data from a controlled steady flow test in the same well were analyzed. Advantages and limitations of the steady and nonsteady flow methods are considered. (Campbell-NWWA) W74-00932

MECHANISM OF FLOW AND CONTROLLED DISSOLUTION OF SALT IN SOLUTION MINING,

Texas Univ., Austin.
H. Kazemi, and F. W. Jessen.
Society of Petroleum Engineers Journal, Vol. 4, No 4, p 317-328, December, 1964. 19 fig, 8 ref.

Descriptors: *Underground storage, *Leaching, *Mining, *Sodium chloride, Solvent extraction, Aqueous solutions, Storage, Salts, Pumping, Diffusion, Convection.

Identifiers: *Storage cavity, Solution-control blanket, Dissolution process, Spherical cavity.

A controlled washing technique was developed to form a spherical cavity in salt (such as might be

used for LPG storage). A study was made of the flow patterns and the concentration distribution of brine during the dissolution of the salt. The general process of forming a spherical cavity involves control of the fluid motion in the cavity, the concentration distribution of brine, the rate of dissolution at the walls of the cavity, and the setting of the inlet and outlet pipes. An inert fluid (lighter than water) such as an oil, gas or air is injected through the annular space between the original hole and the casing. Fresh water is introduced through the innermost pipe (tubing) and brine returns through the casing in the direct circulation scheme. In the reverse-circulation method, the fresh water enters through the casing-tubing annulus and the brine returns through the tubing. Solution of salt is greatest at the point of entry of the fresh water. Reverse circulation is used to ensure divergence of the cavity in the uppermost portion when dissolving a spherical cavity. The controlled downward movement of the inert blanket maintains the upper edge of the expanding cavity exactly on the surface of the projected sphere. An empirical equation expressing the functional relationship between rate of flow in the model and that of the prototype is offered. (Gray-NWWA) W74-00934

A SONIC METHOD FOR ANALYZING THE QUALITY OF CEMENTATION OF BOREHOLE CASINGS,
Schlumberger Sureno S.A., Caracas (Venezuela).
For primary bibliographic entry see Field 08F.
W74-00936

CORROSION CONTROL IN LARGE VOLUME PUMPING BRINE WELLS,
Oilwell Research, Inc., Long Beach, Calif.
For primary bibliographic entry see Field 08G.
W74-00937

PULSE TESTING: A NEW METHOD FOR DESCRIBING RESERVOIR FLOW PROPERTIES BETWEEN WELLS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 08G.
W74-00939

HOW TO FIND ABANDONED OIL AND GAS WELLS,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 08G.
W74-00941

MAXIMIZING WATER YIELD THROUGH WELL DEVELOPMENT—TECHNICAL MEMO NO. 2,
J. F. Howard, and W. R. Holtzhauser.
Water Well Journal, Vol 27, No 4, p 51-53, April, 1973.

Descriptors: Wells, Water wells, *Aquifers, *Drilling equipment, Well screens, *Water yield.
Identifiers: *Water well construction, Water well development, Underreaming, *Acid treatment, Water producing horizons, Double-inflatable packer.

High yield industrial well projects attempt to produce maximum reliable water supplies from a given property through an extensive well development program. Down-hole well development procedures are discussed primarily. Development procedures are divided into two operations, preliminary development and post drilling development, both of which are discussed. Equipment required for development and special procedures for peculiar situations such as the penetration of multiple aquifers are presented. (Smith-NWWA) W74-00943

Field 08—ENGINEERING WORKS

Group 8B—Hydraulics

WELL EFFICIENCY AND SKIN EFFECT,
Maryland Univ., College Park.
For primary bibliographic entry see Field 08G.
W74-00945

THE RANGE OF VALIDITY OF THE LINEAR POLARIZATION METHOD FOR MEASUREMENT OF CORROSION RATES,
Noranda Research Centre, Pointe Claire (Quebec).
For primary bibliographic entry see Field 08G.
W74-00947

CORROSION AND INCRUSTATION - GUIDELINES FOR WATER WELLS,
Universal Oil Products. St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08G.
W74-00948

WHAT'S NEW IN DOWNHOLE OPERATING TECHNOLOGY,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
For primary bibliographic entry see Field 08G.
W74-00950

DEAD END PORE VOLUME AND DISPERSION IN POROUS MEDIA,
Jersey Production Research Co., Tulsa, Okla.
K. H. Coats, and B. D. Smith.
Society of Petroleum Engineers Journal, Vol 4, No 1, p 73-84, March, 1964. 7 fig, 6 tab, 23 ref.

Descriptors: *Porous media, *Diffusion, Flow, *Dispersion, Mathematical models, Cores, Sandstones, Sands, Laboratory tests, Absorption, Heterogeneity, Laplaces equation, Reynolds number.
Identifiers: *Dead-end pores, *Capacitance model, Concentration profile, Formation resistivity factor.

Axial dispersion -- the mixing accompanying the flow of miscible fluids through porous media -- has been considered on the basis of the diffusion model in spite of the deviations between the observed asymmetrical effluent concentration profiles and the predicted symmetrical ones. A laboratory study was made of the displacement of sodium chloride solution by calcium chloride solution from Wassau sand, Ottawa sand, Torpedo sandstone and Alundum. The effluent concentration profile from the two consolidated cores showed considerable asymmetry, while the two unconsolidated cores yielded nearly symmetrical profiles. Breakthrough of the 50% concentration occurred in all tests significantly before one pore volume was injected. The effluent concentration data were compared with the standard diffusion model, a differential form of Dean's finite-stage capacitance model, and a differential capacitance model developed by the authors. The differential capacitance model matched the data significantly better than the diffusion model. The capacitance model allowed the determination of the amount of dead-end pore space in a porous matrix (10% in the Torpedo sandstone) and an estimation of the effect of velocity on the rate of diffusion into this space. (Gray-NWWA)
W74-00951

THE EFFECT OF RESTRICTED FLUID ENTRY ON WELL PRODUCTIVITY,
Shell Oil Co., Los Angeles, Calif.
F. Brons, and V. E. Marting.
Journal of Petroleum Technology, Vol 13, No 2, p 172-174, February, 1961. 4 fig, 2 tab, 6 ref.

Descriptors: *Productivity, *Inflow, *Flow rates, Flow, Hydraulics, Orifices, Flow resistance, Casing, *Wells.
Identifiers: Skin effect, *Perforated casing, Muskats' equations, Pseudo skin factor.

Productivity impairment that results when part of the productive formation is blocked off completely is considered mathematically in terms of 'pseudo skin factors.' The conditions of incomplete penetration of the productive formation and exclusion of parts of the productive zone by blank casing are treated in terms of two parameters. Calculations showed that better productivity is obtained from an interval open in the middle of a productive zone than from the same open interval located at either the top or bottom of the zone. The larger the number of intervals for a given total-penetration ratio, the higher the productivity. Applying the theory qualitatively to a well producing through perforations, the conclusion was that above a certain perforation density the productivity is almost unimpaired and that increasing the number of perforations above this density will add little to the productivity. (Gray-NWWA)
W74-00953

WELL CONSTRUCTION HELPS DETERMINE WATER QUALITY,
Agricultural Research Service, Beltsville, Md. Farmstead Water Systems Research.
For primary bibliographic entry see Field 05B.
W74-00954

DESIGN OF SMALL DAMS.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08A.
W74-01058

SPILLWAYS,
Bureau of Reclamation, Denver, Colo. Spillways and Outlet Works Section.
For primary bibliographic entry see Field 08A.
W74-01067

OUTLET WORKS,
Bureau of Reclamation, Denver, Colo. Spillways and Outlet Works Section.
For primary bibliographic entry see Field 08A.
W74-01068

DIVERSION DURING CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Earth Dams Section.
For primary bibliographic entry see Field 08A.
W74-01069

MAINTENANCE AND OPERATION,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.
For primary bibliographic entry see Field 08A.
W74-01070

8C. Hydraulic Machinery

THE TIDAL POWER POTENTIAL OF UNGAVA BAY AND ITS POSSIBLE EXPLOITATION IN CONJUNCTION WITH THE LOCAL HYDROELECTRIC RESOURCES,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 04A.
W74-00838

8D. Soil Mechanics

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W74-00879

FOUNDATIONS AND CONSTRUCTION MATERIALS,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.
For primary bibliographic entry see Field 08A.
W74-01063

EARTHFILL DAMS,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.
For primary bibliographic entry see Field 08A.
W74-01064

ROCKFILL DAMS,
Bureau of Reclamation, Denver, Colo. Earth Dams Section.
For primary bibliographic entry see Field 08A.
W74-01065

RIPRAP SLOPE PROTECTION FOR EARTH DAMS: A REVIEW OF PRACTICES AND PROCEDURES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
F. J. Davis, L. R. Burton, A. B. Crosby, L. D. Klein, and E. R. Lewandowski.
Available from NTIS, Springfield, Va. 22151 as PB-219 834; Price \$3.00 printed copy; \$1.45 microfiche. Report REC-ERC-73-4, March 1973. 23 p, 17 tab, append.

Descriptors: *Earth dams, *Riprap, *Slope protection, Reviews, Methodology, Design criteria, Engineering structures, Rocks, Slope stability, Quarries, Gradation, Maintenance costs, Economics, Dam construction, Hydraulic structures, Materials.

Bureau of Reclamation practices and procedures for investigation, sampling, testing, and field control of riprap slope protection for earth dams are reviewed. Approximately 50 case histories of riprap slope protection were studied. Economics of providing upstream slope protection, including original and lifetime maintenance costs, is the predominant factor in selecting, designing, and constructing the upstream slope protection. Although experience indicates that rock fragments larger than 1 cu yd would be required on many Bureau earth/dam structures to protect slopes against occasional severe storms, few rock sources can provide fragments of that size. Hence, a 36-inch blanket of riprap graded up to 1 cu yd is considered the maximum protection that can be reasonably obtained. Specifications should be revised to include: (1) a gradation that contains more of the larger sizes, (2) stricter placing requirements to obtain a denser riprap blanket, (3) greater selectivity of quarry material, and (4) closer control of quarry blasting techniques. Detailed instructions to investigators of riprap sources are included. (Woodard-USGS)
W74-01093

8E. Rock Mechanics and Geology

PERMEABILITY RESTORATION IN UNDERGROUND DISPOSAL RESERVOIRS,
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 05E.
W74-00554

NEW MUDS DESIGNED TO IMPROVE DRILLING RATE, HOLE STABILITY,
For primary bibliographic entry see Field 08G.
W74-00946

ENGINEERING WORKS—Field 08

Materials—Group 8G

A STOCHASTIC MODEL FOR PREDICTING VARIATIONS IN RESERVOIR ROCK PROPERTIES,
Alberta Univ., Calgary.
D. W. Bennion, and J. C. Griffiths.
Society of Petroleum Engineers Journal, Vol 6, No 1, p 9-16, March, 1966. 14 fig, 2 tab, 22 ref.

Descriptors: *Porosity, *Permeability, *Mathematical models, *Stochastic processes, *Rock properties, Deposition (Sediments), Fourier series, Cores, Frequency analysis, Mathematics, Computer.
Identifiers: *Orthogonal polynomials, Frequency distribution, Bartlett's test.

A mathematical model was developed that predicts both lateral and vertical variations of reservoir rock properties. The model segmented the reservoir horizontally into areas of common variance; then divided it vertically into strata (if strata were present). Next, trend surface techniques were used to determine the lateral extent and variation of each stratum. The model was tested on two reservoirs. The sandstone reservoir consisted of a sand section and a conglomerate section, although the latter was so sporadic that it was not included in the test. A total of 60,000 samples had been taken from 2000 cored wells. The limestone reservoir consisted of a 'marly' and a 'vuggy' section, with 24,000 samples taken from 430 cored wells. Frequency distributions for porosity were approximately normal but those for log-permeability were generally skewed to the right and leptokurtic. Within the areas of common variance tested, the model was able to distinguish four separate lithological units in the sandstone reservoir; four in the marly section and seven in the vuggy section of the limestone reservoir. The model was able to determine a system of equations for predicting the lateral extent, thickness and mean porosity for each zone. (Gray-NWWA)
W74-00955

FOUNDATIONS AND CONSTRUCTION MATERIALS,
Bureau of Reclamation, Denver, Colo. Div. of Design and Construction.
For primary bibliographic entry see Field 08A.
W74-01063

8F. Concrete

A SONIC METHOD FOR ANALYZING THE QUALITY OF CEMENTATION OF BOREHOLE CASINGS,
Schlumberger Sureco S.A., Caracas (Venezuela).
M. Grosman, F. P. Kokesh, and P. Majani.
Journal of Petroleum Technology, Vol 13, No 2, p 165-171, February, 1961. 17 fig, 1 ref.

Descriptors: *Cement grouting, *Logging (Recording), *Sound waves, *Well casings, Pipes, Acoustics, Attenuation, Bonding, Boreholes.
Identifiers: *Cement Bond log, *Sonic pulse, Squeeze cementing, Amplitude, Water shut-off.

Bonding of cement to the casing is an important factor in satisfactory well completion. The Cement Bond log operates on the principle that the attenuation of a sonic pulse transmitted by a casing is greatly increased when that casing is bonded to an outer annulus of hard material (such as set cement) which has an appreciably smaller sonic wave velocity than that of the casing. The downhole tool contains a source of recurrent sound pulses which are detected by a receiver spaced a few feet from the source. The amplitude of the detected casing-borne pulse is measured, and the resulting signal is transmitted to the surface where it is recorded for corresponding depths. Because amplitude is a function of attenuation, the log is readily interpreted. Laboratory studies showed that cement that had not set or was not bonded to

the casing had little attenuating effect. Field examples show that the log shows not only the top of the cement but also variations in cementation quality. Increase in bonding with time and after squeeze cementing are shown by logs. (Gray-NWWA)
W74-00936

CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Hydraulic Structures Branch.
For primary bibliographic entry see Field 08A.
W74-01066

8G. Materials

GENERALIZATION OF HAEFELI'S CREEP-ANGLE ANALYSIS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W74-00687

ERRORS IN PIEZOMETRIC MEASUREMENT,
Geological Survey, Washington, D.C. Water Resources Div.
W. W. Emmett, and J. R. Wallace.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 90, No. HY6, p 45-61, November, 1964. 11 fig, 1 tab, 11 ref, 2 append.

Descriptors: *Piezometry, Wells, Groundwater, Aquifer characteristics, *Open channel flow.
Identifiers: *Piezometric measurement, Rough channel tests, Smooth channel tests.

Engineering investigations of fluid flow in open channels usually require the measurement of piezometric head. Often the measurement is made by recording the pressure at a piezometer opening on the wall or floor of the channel. An accurate interpretation of the measurement depends on a knowledge of the performance of the piezometer and of the characteristics of the flow being measured. A laboratory investigation was conducted to study the accuracy of piezometric depth measurements in open channels. Influences of boundary geometry and flow characteristics on the piezometric measurements were evaluated. The results of over 3,000 observations indicate that errors in piezometric measurement of depth in smooth, open channels are a function of mean velocity and piezometer hole diameter. For a given piezometer size, the error is expressed as a constant percentage of the mean velocity head. Roughness added to the test channel tended to reduce the magnitude of the error, while mechanically generated surface waves did not influence the piezometric measurement. (Smith-NWWA)
W74-00931

WHAT YOU SHOULD KNOW ABOUT PUMPING TESTS. TECHNICAL MEMO NO. 1,
Illinois State Water Survey, Urbana.
W. H. Walker.
Water Well Journal, Vol. 27, No. 2, p 26-27, March, 1973. 2 fig.

Descriptors: Aquifer characteristics, Hydraulics, Wells, *Water wells, Ground water, *Data collections, *Testing procedures, Analytical techniques, Recharge.
Identifiers: Cone of depression, Barrier boundaries, *Well efficiency.

Much has been written about the analysis of pumping data, without explaining the why and how of the test or the data needed for analysis. The how and why become apparent when a few basic principles of ground water hydrology and the definition of key terms such as: cone of depression; recharge and barrier boundaries; well effi-

ciency and 'hydraulic characteristic' are understood. Basic principles and definitions are explained. The Illinois State Water Survey's procedure for data acquisition for their three-part analysis, constant rate test, recovery test and step test is presented. (Campbell-NWWA)
W74-00933

CORROSION CONTROL IN LARGE VOLUME PUMPING BRINE WELLS,
Oilwell Research, Inc., Long Beach, Calif.
C. C. Wright.
Materials Protection and Performance, Vol 11, No 1, p 23-26, January, 1972. 1 tab, 7 ref.

Descriptors: *Corrosion, Pitting, *Electrolysis, Scaling, Water chemistry, Bacteria, Materials, Bactericides, Analytical techniques, Wells, *Water wells, Dissolved oxygen.
Identifiers: *Crustation, Oxygen scavengers, *Corrosion inhibitors, Acid treatments, Monitoring programs.

Large volume salt water wells are being increasingly used for cooling waters, water for secondary recovery of oil, and the extraction of minerals. Production of large volumes of brines from pumping wells poses corrosion problems which are either absent or minimized in fresh water wells and in low volume brine wells. Recognition of the differences i.e. large casings, high water velocities, high dissolved gas content; the causes of corrosion, i.e., highly corrosive natural waters, D.O. from cascading water, electrolytic cell formation, bacteria; and preventative measures, i.e., proper material selection, use of oxygen scavengers, corrosion inhibitors, and bactericidal treatments can save sizeable sums of money. Customary control procedures, recommended facility modifications and a continuing monitoring program are described. (Hunt-NWWA)
W74-00937

PULSE TESTING: A NEW METHOD FOR DESCRIBING RESERVOIR FLOW PROPERTIES BETWEEN WELLS,
Esso Production Research Co., Houston, Tex.
C. R. Johnson, R. A. Greenkorn, and E. G. Woods.
Journal of Petroleum Technology, Vol 18, No 12, p 1599-1604, December, 1966. 8 fig, 1 tab, 8 ref.

Descriptors: Flow, *Unsteady flow, *Transmissibility, Storage, *Pressure measuring instruments, Pressure, Oil reservoirs, Heterogeneity, Fractures (Geologic).
Identifiers: *Pulse testing, *Well pair, Differential pressure gauge, Interference tests, Response amplitude, Pulse interval.

The basic element in pulse-testing is the well pair. At the pulsing well a series of flow disturbances is generated by alternate intervals of flow and shut-in. A corresponding series of pressure transients propagates through the reservoir and arrives at an adjacent responding well. If the responding well has some wellhead pressure, the slight pressure changes are detected by a sensitive differential-pressure gauge (sensitivity about 0.001 psi). Pulses of a few hours in duration will generate a measurable response in most reservoirs. Consequently, many well pairs can be tested in a short period of time with little disturbance of field operations. Comparison of pulse-test results to conventional testing methods showed that the pulses obeyed unsteady-state, compressible-flow theory and thus gave a measure of both transmissibility and storage. In addition, the method was used qualitatively to describe communication across faults and between zones, and the direction and magnitude of fracture trends. (Gray-NWWA)
W74-00939

Field 08—ENGINEERING WORKS

Group 8G—Materials

HOW TO FIND ABANDONED OIL AND GAS WELLS,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
K. H. Johnston, H. B. Carroll, R. J. Heemstra, and F. E. Armstrong.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price \$0.75. Information Circular No 8578, 1973. 46 p, 25 fig, 3 tab, 4 append.

Descriptors: *Wells, Oil wells, Technology, *Well regulations, *Methodology.

Identifiers: Electronic metal detectors, Methane detectors, *Abandoned wells, *Search techniques, Coal deposits, Gas wells, Law enforcement.

This guide was written to furnish the coal industry with a description of techniques, instruments, and clues on how to find abandoned oil and gas wells that have penetrated coal seams. Specific information is included on searching techniques currently in use by several coal mining companies, gas-transmission companies, and waterflood operators, as well as information on State agencies responsible for the enforcement of laws and the preservation and distribution of data pertaining to the drilling, development, and abandonment of oil and gas wells. Comparative tests were performed with several commercial electronic metal detectors to determine the feasibility of using them to aid in the search for abandoned wells and to determine the instrument most suited for the particular use. The role of methane detectors to locate abandoned wells is described, including a case history. Tests were made to develop an efficient procedure to follow in systematically searching an area for metallic clues or hydrocarbon evidence to abandoned wells. The guide describes, in detail, a search sequence, including the collection of basic data, preparation of the selected area, and the physical search. Methods are given for evaluating the results. (Hunt-NWWA)

W74-00941

DETECTION AND ESTIMATION OF DEAD-END PORE VOLUME IN RESERVOIR ROCK BY CONVENTIONAL LABORATORY TESTS, California Univ., Berkley.

I. Fatt, M. Maleki, and R. N. Upadhyay. Society of Petroleum Engineers Journal, Vol 6, No 3, p 206-212, September, 1966. 12 fig, 1 tab, 14 ref.

Descriptors: *Permeability, *Porosity, *Laboratory tests, Cores, Limestones, Porous media, Rock properties, Capillary action, Flow.

Identifiers: *Formation factor, Dead-end pores, *Oomoldic limestone, Mercury injection, Miscible displacement, Pressure transients.

Equations conventionally used to describe reservoir flow behavior contain the implicit assumption that all connected pore spaces contributed to both porosity and permeability. Laboratory studies were made on two limestones suspected of having dead-end pore spaces, and on a sandstone believed to have little or no dead-end pore spaces. Using 3/4-inch diameter core plugs, measurements were made of the electric logging formation factor, mercury injection capillary pressure, miscible displacement, and pressure transient behavior. Methods are described and results are shown graphically. These tests indicated that about 20% of the measured pore volume in the two limestones was not taking part in fluid flow. The size of the neck connecting dead-end pores to the main flow channels was estimated from the pressure transient tests. The formation factor and mercury injection tests can be made at relatively low cost on reservoir rock samples. From results of these tests, samples suspected of having dead-end pore space can be selected for the more diagnostic miscible displacement and pressure transient tests. (Gray-NWWA)

W74-00944

WELL EFFICIENCY AND SKIN EFFECT, Maryland Univ., College Park.

Y. M. Sternberg.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No 1R2, p 203-206, June, 1973. 2 append, 8 ref.

Descriptors: *Wells, Water wells, *Aquifer characteristics, Permeability, Hydraulics, Mathematical studies, Equations.

Identifiers: Radius of influence, Laminar flow, *Hydraulic conductivity, Head loss, *Well efficiency.

A technique is presented for determining the skin effect using previously derived flow equations. This technique is applicable only to wells affected by losses due to laminar flow (both the normal losses and those in the damaged zone) and does not account for turbulent losses that may be present in large capacity wells. Drawdown data taken at an observation well and at the pumped well, operating at constant discharge, are required in this method. The condition of a well can be determined by comparing actual drawdown at the pumped well to the calculated values using the aquifer characteristics determined from an observation well. (Hunt-NWWA)

W74-00945

NEW MUDS DESIGNED TO IMPROVE DRILLING RATE, HOLE STABILITY, G. R. Gray.

World Oil, Vol 176, No 6, p 84-86, May, 1973. 1 fig, 36 ref.

Descriptors: Wells, *Well drilling, *Drilling fluids, Mud, *Rock mechanics, Hydraulics, Chemical reactions, Polymers.

Identifiers: *Low solids, Drilling fluids, Balanced pressure drilling, *Borehole stability, *Organic polymers, Shale hydration.

Maximum drilling rate with good hole conditions is being sought by intensive studies of factors affecting penetration rate and hole stability. Balanced pressure drilling, minimum solids, drilling fluids, and control of shale hydration have practical applications as part of a minimum cost drilling program. Currently the emphasis is on the use of minimum solids muds for maximum penetration rate, coupled with organic polymers for hole stability. Advantages of balanced pressure drilling have been amply documented. The types and uses of low solids drilling fluids to achieve maximum penetration, prevent shale hydration and improve hole stability are presented. (Campbell-NWWA)

W74-00946

THE RANGE OF VALIDITY OF THE LINEAR POLARIZATION METHOD FOR MEASUREMENT OF CORROSION RATES, Noranda Research Centre, Pointe Claire (Quebec).

R. L. Leroy.

Corrosion, Vol 29, No 7, p 272-275, July, 1973. 6 fig, 11 ref.

Descriptors: *Corrosion, Mathematical studies, *Graphical methods, *Analytical techniques.

Identifiers: *Linear polarization, Corrosion potential, *Tafel slopes.

The validity of the linear polarization method for determining corrosion rates is critically examined. It is shown that curvature of polarization curves at the corrosion potential does not negate the value of this technique. Diagrams are presented which show the matrix of anodic and cathodic Tafel slopes for which the linear polarization method can be used to derive the corrosion current, within a stated error limit. Several examples demonstrate the utility of these diagrams for both anodic and cathodic linear polarization measurements. (Smith-NWWA)

W74-00947

CORROSION AND INCRASTATION - GUIDELINES FOR WATER WELLS, Universal Oil Products. St. Paul, Minn. Johnson Div.

J. L. Mogg.

Water Well Journal, Vol 27, No 2, p 30-33, 35-36, March, 1973. 1 fig, 6 tab, 4 ref.

Descriptors: Corrosion, Scaling, Well screens, Materials, *Corrosion control, *Iron bacteria, *Bactericides, Water quality, Chemicals, *Water wells, Sulfur bacteria.

Identifiers: *Incrastration, *Sulfate-reducing bacteria, Ryznar Stability Index, Chemical corrosion, Electrochemical corrosion, Electromotive series, Acid treatments.

Corrosion, incrastration and bacterial plugging are defined and discussed with respect to their causal effects on water well failure. The two processes of corrosion, chemical and electrochemical, and the relationship of water chemistry and the electromotive series to metals as the cause of corrosion is presented. Guidelines for selecting the most corrosion resistant metal by use of the Ryznar Stability Index for Material are presented. The parameters for probable occurrence of iron and sulfate-reducing bacteria and methods for reducing or eliminating the effects of incrastration and bacterial plugging are presented. (Hunt-NWWA)

W74-00948

WHAT'S NEW IN DOWNHOLE OPERATING TECHNOLOGY, Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).

R. Desbruyeres.

World Oil, Vol 176, No 7, p 74-75, 78, June, 1973. 3 fig, 22 ref.

Descriptors: *Geophysics, *Borehole geophysics, *Logging, Resistivity, Gravity studies, Technology.

Identifiers: Nuclear magnetism log, Unbound case fluids, Spherically focused log, Sheer wave velocities.

Important advances in tools for analyzing well potential and performance have been made since last year's comprehensive review, World Oil, April, 1972. Downhole logging techniques for determining formation properties in drilling wells and new completions, and improvements in geophysical surveying are emphasized. Information on several drilling and production aids, such as downhole 'listening' device to detect sand production and a unique electronic method for continuously measuring amount of drill pipe in the hole are presented. Logging while drilling, open hole logging, cased hole logging, logging for geophysics and transmitting and handling log data are discussed. (Smith-NWWA)

W74-00950

CORROSION CONTROL IN WATER WELLS, Black, Crow and Eidsness, Inc., Gainesville, Fla. For primary bibliographic entry see Field 05F.

W74-00952

BOREHOLE LOGGING INVESTIGATIONS IN THE CHALK OF THE LAMBOURN AND WINTERBOURNE VALLEYS OF BERKSHIRE, Institute of Geological Sciences, London (England).

T. K. Tate, A. S. Robertson, and D. A. Gray.

Research Rept No. 5, 1971. 23 p, 13 fig, 3 tab, 7 ref, 2 append.

Descriptors: *Geophysics, *Electrical well logging, Borehole cameras, Boreholes, *Geothermal studies, *Resistivity, Subsurface investigations, Subsurface waters, Wells, *Groundwater movement.

Identifiers: Great Britain, Regional groundwater flow.

ENGINEERING WORKS—Field 08

Fisheries Engineering—Group 81

The results of borehole investigations made in nine production and ten observation boreholes sunk in the Chalk of the Lambourn and Winterbourne Valleys, Berkshire, Great Britain, are described. Electrical resistivity, temperature, electrical conductivity, and borehole fluid velocity are examined. Evidence suggests that the level at which pump suction is placed influences the yield drawn from different contributory levels, even though the total amount of water withdrawn may be the same. It is concluded that the principal inflows of groundwater to the boreholes occur at or near the bottom of the casing, with relatively small contributions from fractures at depth. Inflows take place at such restricted levels that generalized assumptions concerning the thickness of the aquifer may be unwarranted. The significance of these observations in terms of regional ground water flow is briefly discussed. (Hunt-NWWA)
W74-00956

8I. Fisheries Engineering

SALTWATER POND RESEARCH, Texas Parks and Wildlife Dept., Austin.

L. L. Elam.

Available from NTIS, Springfield, Va., 22151 as COM-72-11292 Price \$3.00 printed copy; \$1.45 microfiche. Completion report for NOAA, National Marine Fisheries Service, May 1972. 62 p. 28 tab, 7 ref. 2-78-R.

Descriptors: *Marine fish, *Ponds, *Saline water, *Fisheries, *Fish management, Investigations, Testing procedures, Growth rates, *Texas, Marketing techniques, Trout, Oysters, Shrimp, Spawning, Fish diseases, Mortality, Ecology, Biology.

Identifiers: *Saltwater ponds, Red drum, Spotted seatrout, Southern flounder, Black drum, Sheepshead.

Pond culture experiments were initiated in Texas at the Marine Research Station in the fall of 1969. Postlarval brown and pink, and juvenile brown, pink and white shrimp were stocked at various rates, different durations of study periods, different feeding levels, and various salinity ranges. Research on marine fishes included: studies to determine mortality rates of fish released after capture with commercial fishing gear, studies concerning the propagation of selected fishes, and pond studies on marine fishes adaptable to pond culture. Species studies included red drum, spotted seatrout, southern flounder, black drum, and sheepshead. Research concerning oyster growth, survival, adaptability to pond environment, and disease resistant capabilities were conducted. Replicate studies were conducted in a clay and an asphalt bottom pond to determine the suitability of weathered asphalt as a bottom substrate for oyster culture operation. Oyster mortalities in the asphalt bottom pond were similar to those which occurred in the clay bottom ponds but growth in the clay bottom ponds was better. Moderate *Labyrinthomixis* sp. infections were recorded in all pond-held oysters sampled. Light infection intensities were recorded from oysters held in the bay. (Woodard-USGS)
W74-00815

HISTORY OF IMPORTING RAINBOW TROUT, PARASALMO GAIRDNERII (RICHARDSON, 1836) INTO BOHEMIAN COUNTRIES, (IN CZECH), Ceskoslovenska Akademie Ved, Prague.

L. Kalal.

Identifiers: History, Parasalmo-Gairdnerii, *Rainbow trout, *Trout rearing, *Czechoslovakia.

The rainbow trout *P. gairdnerii* has been reared in Bohemian Countries since the year 1888. The end of World War II (army transfers) dealt a heavy blow to the rearing of this fish. New generative material

was reared from fish eggs and yearlings imported from Denmark from 1946-1949. Trout rearing of the State Pisciculture and in most cases also of the Anglers' Association have therefore a uniform material in general, which proved well. New imports did not take place until the middle sixties. One import was realized from the USA, 3 imports from Denmark, one from Poland. The origin of fish imported from the USA has been impossible to find, from Denmark, according to information of the importers the form 'kamloops' was obtained, the fish from Poland originate from fish eggs imported from the station of the Seattle University, Washington (USA). Fish from new imports are being observed and until their rearing qualities are determined, their spreading is not recommended. For rearing and especially breeding reasons it is necessary to keep an exact account of them and of future imports.—Copyright 1973, Biological Abstracts, Inc.
W74-01019

EXPERIMENTAL STUDIES OF POLYCULTURE IN 1971,

Fish Culture Research Station, Dor (Israel).

A. Yashouv, and A. Halevy.

Bamidreh. Vol 24, No 2, p: 31-39. 1972.

Identifiers: *Carp, Cultures, Polyculture, *Silver carp, *Tilapia-Aurea, *Tilapia-Vulcani.

Experiments were carried out on polyculture of carp, silver carp and tilapias under fertilization and with and without supplementary feedings. Yields obtained in 187 days' growth without supplementary feeding reached 2350 kg/ha with biweekly fertilization and 1980 kg/ha with weekly fertilization. Experiments with weekly fertilization and supplementary feeding gave the following results in 223 days of growth: 9140-10, 620 kg/ha in ponds with Tilapia vulcani and 8570-9450 kg/ha in ponds with *T. aurea*. Weekly fertilization without supplementary feeding gave increased carp and silver carp yields, but not Tilapia yields. Supplementary feeding (pellets) increased carp yields 4-fold, and the Tilapia yield 7-fold. The silver carp were hardly influenced by the pellets. The coefficient of exploitation of supplementary feed (pellets) was 1.25 in ponds with Tilapia vulcani and 1.39 with *T. aurea*.—Copyright 1973, Biological Abstracts, Inc.
W74-01021

EFFICIENCY OF MULLET GROWTH IN FISH-PONDS,

Fish Culture Research Station, Dor (Israel).

A. Yashouv.

Bamidreh. Vol 24, No 1, p: 12-25. 1972.

Identifiers: *Cyprinus carpio*, *Fish growth, *Mugil capito*, *Mugil cephalus*, Ponds, *Mullet growth, *Tilapia aurea*.

Gray mullet (*Mugil cephalus*) was grown in monoculture in ponds, and also in polyculture with *Mugil capito*, *Tilapia aurea* and *Cyprinus carpio*. The ponds were fertilized with superphosphate and ammonium sulfate and with chicken manure. There was no clear effect of crowding on the growth of gray mullet in monoculture, but this species showed enhanced growth when grown in polyculture with the other species. The other species, however, were somewhat stunted on their growth in the presence of gray mullet.—Copyright 1973, Biological Abstracts, Inc.
W74-01022

REMARKS ON THE STOCKING OF THE DAM RESERVOIR AT PRZECZYCE WITH LAKE TROUT *SMALO TRUTTA M LACUSTRIS* L.,

Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.

Z. Wajdowicz.

Acta Hydrobiol. Vol 14, No 2, p 205-212. 1972. Illus.

Identifiers: Dams, Lakes, *Poland (Przeczyce), Reservoirs, *Salmo-Trutta-M-Lacustris*, Spawning, *Stocking, *Trout.

As the result of stocking the dam reservoir at Przeczyce (Poland) numerous young lake trout were found in the river above the dam and individual adult specimens were found in the reservoir. During autumn a few spawning migrations of mature lake trout from the reservoir to the river were observed. Individual spawned females were found, but no spawning traps. Smolts of lake trout were bred from artificially inseminated spawn. The emptying of the reservoir interrupted the process of acclimatization. Some factors impeding full acclimatization, which is determined by natural spawning, are described.—Copyright 1973, Biological Abstracts, Inc.
W74-01072

AQUATIC VEGETATION OF FISHPONDS OF THE WESTERN REGIONS OF THE UKRAINE, (IN RUSSIAN),

Ukrainian Research Inst. of the Fish Industry, Kherson (USSR).

For primary bibliographic entry see Field 04A.

W74-01075

WEIGHT-LENGTH RELATIONSHIP AND GROWTH OF CHANOS CHANOS (FERSSKAL) GROWN IN FRESHWATER PONDS,

Institute of Fisheries Development and Research, Diliman, Quezon City (Philippines).

R. O. Juliano, A. U. Baes, R. F. Ventura, and A. O. Isidro.

Nat Appl Sci Bull. Vol 22, No 3/4, p 113-131, 1970. Illus.

Identifiers: Carp, *Chanos-chanos, Freshwater ponds, Growth, Length, Ponds, *Red carps, Weight, *Milkfish.

Based on data regularly sampled on a monthly basis in 4 freshwater ponds, the weight-length relationship equations of milkfish covering a size range from 80 mm to 200 mm are as follows: $\text{Log } W \pm 5.73591 + 3.31866 \log L$ for Pond 4, $\text{Log } W \pm 5.17666 + 3.5995 \log L$ for Pond 6 (1968), $\text{Log } W \pm 5.01705 + 2.96479 \log L$ for Pond 5, and $\text{Log } W \pm 5.07492 + 3.00273 \log L$ for Pond 6 (1969). The culture period ranged from 2-5 mo. Analysis of the variance of condition factor (K) of the fish at different lengths and in different ponds showed no significant difference. Isometric growth is apparently exhibited by the milkfish within the size range in the experiment. Growth increments in length and in weight are as follows: 91.8 mm and 7.6 grams (5 mo. rearing) in Pond 4, 98.2 mm and 52.8 grams (4 mo. rearing) in Pond 5, 90.1 mm and 43.4 g (2 mo. rearing) in Pond 6 (1968), and 101.6 mm and 55.2 g (4 mo. rearing) in Pond 6 (1969). The use of the Walford growth transformation curve to predict the L seems not practical on monthly sampled data. Mixing of red carps with milkfish in one of the ponds did not inhibit the rate of growth of milkfish.—Copyright 1973, Biological Abstracts, Inc.
W74-01080

OBSERVATIONS ON THE DEVELOPMENT OF COREGONUS PELED (GMEL.) FRY IN PONDS,

Panstwowy Instytut Hydrologiczno-Meteorologiczny, Mikolajki (Poland).

S. Bernatowicz.

Acta Hydrobiol. Vol 14, No 2, p 165-172, 1972.

Identifiers: *Coregonus-peled, *Fry, Ponds, *Stocking, Growth rates, Fish parasites.

The main difficulty encountered in the production of stocking material of *C. peled* in ponds are high losses in the first year of age. Observations were made on the growth of *C. peled* fry in the period from spring to autumn. Growth rate, condition, survival and parasites were also considered.—Copyright 1973, Biological Abstracts, Inc.
W74-01081

Field 08—ENGINEERING WORKS

Group 81—Fisheries Engineering

ALGAE FEEDING OF YOUNG OF CERTAIN FISH SPECIES OF THE KAIRAK-KUMSKII RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe.
Institut Zoologii i Parazitologii.

S. A. Andrievskaya.

Izv Akad Nauk Tadzh Ssr Ost Biol Nauk. 1, p 49-53, 1972.

Identifiers: *Algae, Bacillariophyta, Chlorophyta, Cyanophyta, Euglenophyta, Fish foods, Plankton, Reservoirs, Species, USSR (Kairak-Kumskii reservoir), Zooplankton.

Contents of 195 intestines of 11 spp. of fish young were studied in order to evaluate consumption of algae by larvae, fry and current brood (1963-1964). Composition of food lumps was analyzed visually in terms of percentage of total food. Research showed that during the summer fish young eat benthos, zooplankton, and plant organisms. Species of algae found were enumerated, including 7 spp. of Cyanophyta, 34 of Bacillariophyta, 2 of Euglenophyta, and 19 of Chlorophyta. Plant detritus and slime were observed in intestines of all species to different degrees. It is concluded that during the summer, some species feed primarily on crustaceans and midge larvae; other species feed primarily on algae, plant residue, slime struts.—Copyright 1973, Biological Abstracts, Inc. W74-01082

WHITE AMUR IN THE ILI RIVER BASIN, (IN RUSSIAN),
G. M. Dukravets.

Izv Akad Nauk Kaz Ssr Ser Biol. 1, p 52-57, 1972.

Identifiers: Ctenopharyngodon idella, Phylogenesis, Rivers, *USSR (Ili River basin), "White amur.

The white amur-Ctenopharyngodon idella (Val.) was first brought into Balkhash-Ili basin USSR, in 1958. This species is now established up to the source of the river and throughout the area, and plays an important role in ichthyocenoses and influences phytocenosis formation. Morphological characteristics and growth indices are tabulated.—Copyright 1973, Biological Abstracts, Inc. W74-01083

COMPARATIVE EFFICIENCY OF THE AREA UNIT USED FOR FISH BREEDING AND OTHER AGRICULTURAL PURPOSES, (IN RUSSIAN),

Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).

G. I. Shpet.

Gidrobiol Zh. Vol 8, No 3, p 62-68, 1972. (English summary).

Identifiers: Breeding, *Carp breeding, Comparative efficiencies, Fish breeding.

The productivity of the area unit used for fish breeding is compared with that for other agricultural purposes. On the basis of the author's original data and those from references, it is concluded that carp breeding is the most productive fishery.—Copyright 1973, Biological Abstracts, Inc. W74-01084

EXPERIMENTAL STUDIES ON FEEDING THE COMMON CARP CYPRINUS CARPIO L. IN EGYPT,

Cairo Univ., Giza (Egypt). Faculty of Science.

H. M. Bishai, W. D. Labib, and M. M. Ishak.

Bull Inst Oceanogr Fish. 2: p 275-295. 1972. Illus.

Identifiers: Bran, *Carp, Cottonseed, Cyprinus Carpio, *Egypt, *Fish foods.

Feeding tests for the common carp *C. carpio* fingerlings of about 3 mo. old were carried out for a period of 8 mo., from Oct-June. The test feeds were rice bran, cotton seed-cake and 4 diet-mixtures of different proportions of rice bran and cotton seed-cake. During the experimental period, the monthly water temperature ranged between 14.7

and 31.4C. Cotton seed-cake gave a better growth for the fish than rice bran feed. However, cotton seed-cake is not recommended as the sole diet for carp due to the relatively high cost of production and due to changes in the flavor of the fish flesh. For both feeds, increasing the level of feeding from 10-20% daily of the fish weight did not significantly increase the growth rate of the fish. The addition of cotton seed-cake to rice bran improved the efficiency of rice bran as a diet for carp. The diet mixture composed of 75% rice bran and 25% cotton seed-cake gave the highest gain in weight at a relatively low cost, comparable to cotton seed-cake. In spite of the abundant supplementary food given to the fish, they did not show appreciable gain in weight during the winter months of Dec.-Feb. The natural diet alone present in the cement experimental ponds failed to satisfy the requirements of maintenance and growth for the experimental fish.—Copyright 1973, Biological Abstracts, Inc. W74-01100

For primary bibliographic entry see Field 05B.
W74-00793

BIBLIOGRAPHY OF REPORTS ON THE WATER RESOURCES OF INDIANA PREPARED BY THE U.S. GEOLOGICAL SURVEY, 1886-1972,

Geological Survey, Indianapolis, Ind.

For primary bibliographic entry see Field 02E.
W74-00814

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

MICHIGAN WATER RESOURCES ENFORCEMENT AND INFORMATION SYSTEM,
Michigan Dept. of Natural Resources, Lansing.
Water Resources Commission.

For primary bibliographic entry see Field 05G.
W74-00701

10B. Reference and Retrieval

PRIMINARY SYSTEM DEVELOPMENT, CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05B.
W74-01092

10F. Preparation of Reviews

ALGAE ABSTRACTS, A GUIDE TO THE LITERATURE, VOLUME 1 TO 1969; VOLUME 2, 1970-1972,
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05C.
W74-00704

THE EFFECTS OF STRIP MINING UPON NAVIGABLE WATERS AND THEIR TRIBUTARIES: DISCUSSION AND SELECTED BIBLIOGRAPHY,

Pittsburgh Univ., Pa. Graduate Center for Public Works Administration.

For primary bibliographic entry see Field 05C.
W74-00725

FACTORS OF CHEMICAL FERTILIZATION IN SALINE WATER IRRIGATION: A REVIEW,
Negev Inst. for Arid Zone Research, Beersheba (Israel). Dept. of Plant Introduction and Ecology.
For primary bibliographic entry see Field 03C.
W74-00757

OXYGEN-CONSUMING ORGANIC MATTER (BOD) IN EFFLUENTS ORIGINATING IN DIFFERENT PULPING PROCESSES OF THE WOODWORKING INDUSTRY: REVIEW OF LITERATURE DURING THE YEARS 1960-1970,
Finnish Pulp and Paper Research Inst., Helsinki.

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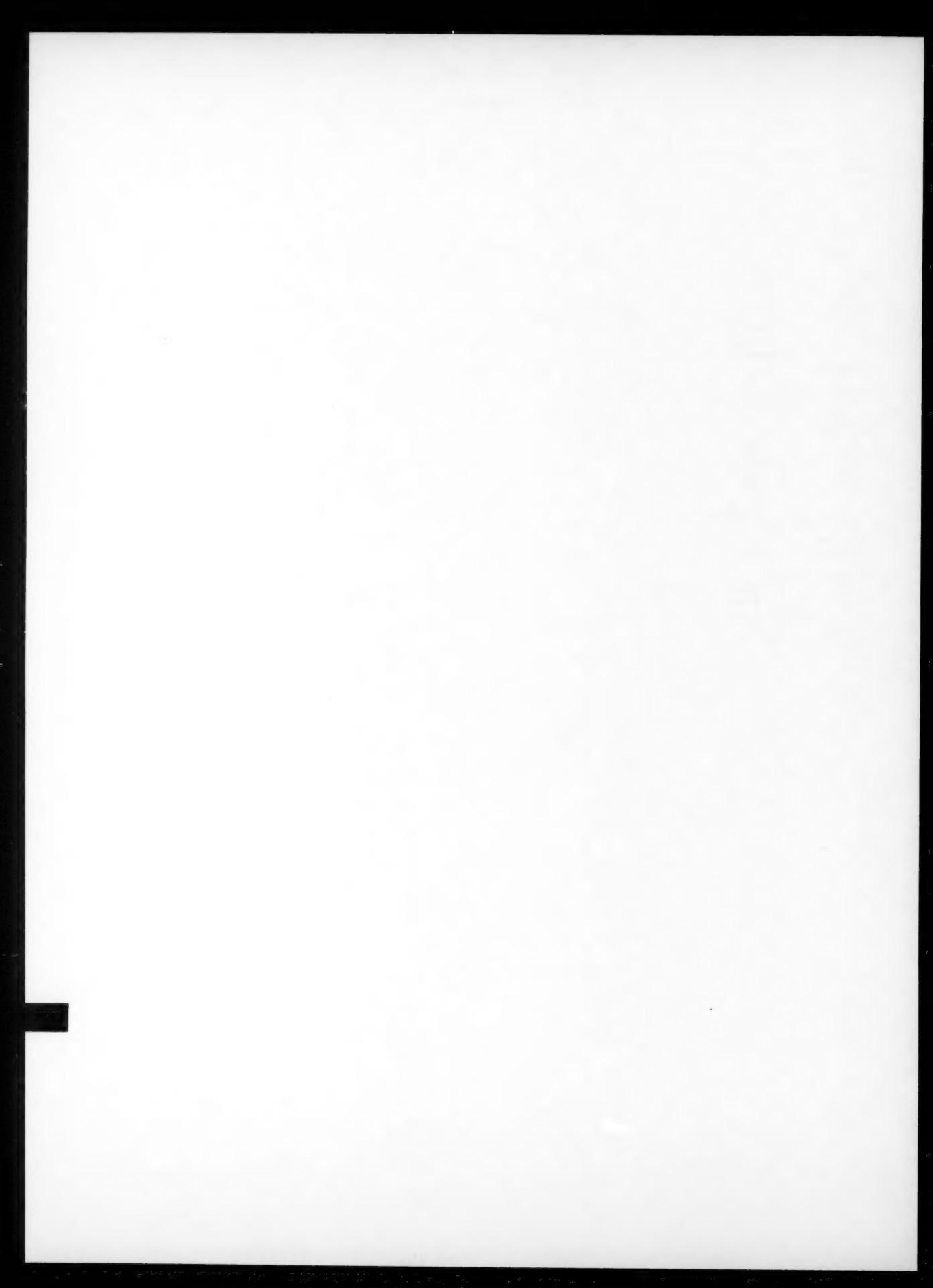
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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